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A STUDY OF CHOICE BEHAVIOR OF THREE AGE GROUPS UNDER THREE  
DIFFERENT TREATMENTS OF A PROBABILITY LEARNING TASK

by

PETER GEORGE STRUTZ

A THESIS

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FACULTY OF GRADUATE STUDIES

The undersigned certify that they have read and recommend to the Faculty of Graduate Studies for acceptance a thesis entitled "A Study of Choice Behavior of Three Age Groups Under Three Different Treatments of a Probability Learning Task," submitted by Peter George Strutz in partial fulfilment of the requirements for the degree of Doctor of Philosophy.



## ABSTRACT

The problem investigated was concerned with the choice behavior of three age groups under three treatments of increasing complexity in a probability learning task. Four variables (age, treatment, sex and repeated trials) were considered and were analyzed by means of various visual comparisons of the responses curves and by a number of  $2 \times 2 \times 2$  factorial designs of analysis of variance.

Choice behavior is conceived as a resultant of the interaction between more fundamental cognitive processes. Piaget's formulations of mechanisms and behavior operative during various developmental periods of growth provided the theoretical basis. It was postulated that at various stages of cognitive development choice behavior strategies would emerge which would be indicative of the cognitive processes operative at that stage of development.

The three age groups used in this study were selected on the basis of Piaget's stages of development while Siegel's work provided the design of the tasks.

For all three groups in all three treatments the results indicated that the three age groups could be differentiated in terms of the strategies used and /or the number of correct responses realized in predicting events. With increasing task complexity, greater differentiation appeared between the age groups in terms of the strategies used and of the success of these strategies in predicting the correct events. Progressive or increasing complexity is defined in terms of the treatments used: random, simple pattern and multiple patterns.

In treatment I the 4-6 year age group and the adult group displayed a tendency to use pure strategy, while the 7-10 year age group used some form of mixed strategy. Also, the two older groups achieved on asymptotic level at about 120 trials. The 4-6 year age group had not yet attained a stable state at 200 trials.



In treatment II (simple pattern) only the adults were able to detect the pattern, learn it and use a patterned response strategy. The 4-6 year age group tended towards pure strategy, while the 7-10 year age group displayed a tendency towards mixed strategy. After the reversal shift in the pattern the adults were very quick to make the appropriate adjustment. The 7-10 year age group required nearly twice as many trials to make the adjustment and the 4-6 year age group took three times as many trials as did the adults.

The complexity of treatment III (multi-pattern) provided the basis for the highly significant separation of the three age groups.

Generally, the findings were significant and supported all hypotheses except those dealing with sex differences.

It may be concluded that the 4-6 year olds, as a group, perceived the events in each of the three treatments to be random and resolved the probability learning task in the three treatments by using "pure" strategy. Similarly, the 7-10 year olds behaved as if they too perceived the events to be random but resolved their task by using some form of mixed strategy. The adults were able to differentiate between the random and patterned events and to abstract information with which to develop more appropriate strategies.

There is reason to conclude that learning of patterned events is a formal operations task. Further, a complexity hierarchy, useful in further research can be generated by patterning the events and by varying the number of alternative events.



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## CHAPTER I

### INTRODUCTION

Human choice-making behavior is related to problem-solving and concept formation. Typically, the former behavior has been investigated by having the individual predict which event or set of events will occur at some specific time, with the events arranged to occur in a fixed relative frequency and in some fixed pseudo "random" order. The individual, faced with the necessity of developing a strategy for making predictions in this situation, apparently makes new choices utilizing information processed from the results of previous attempts. Eventually, noticeable intra-individual consistencies in predicting or choice-making develop. Usually from this point onward the behavior tends to stabilize. This stable-state behavior is referred to as the attainment of an asymptotic level. Actually, a stable state may or may not be asymptotic in the strict mathematical sense. Nonetheless, in this study it will be used to denote a relatively fixed level of behavior succeeding an earlier period of learning.

Studies of choice behavior and related topics, such as problem-solving and concept formation, have been replete in psychological literature. Chown (1959) and Duncan (1959) have adequately reviewed this literature but these studies have failed to isolate important variables which influence choice behavior. Perhaps past approaches to research in this area have been too unsystematic. As a consequence, these studies of problem-solving have yielded only isolated bits of



information about the refractory problem of choice behavior. This is not to say that all of these studies have been unproductive; on the contrary, Piaget (1937, 1945) and his collaborator, Inhelder, have provided current developmental psychology with valuable descriptions and speculations about what transpires during cognitive development from early childhood to adulthood. Hunt (1962) and Flavell (1963) provide good reviews of Piaget's and Inhelder's work.

Kendler and Kendler (1962, 1963) use a different approach to problem-solving by utilizing the neobehavioristic construct of the response-produced cue as a mediator between the external stimulus and the external response in a problem-solving task.

It appears that choice behavior theory, concept-formation, decision-making, information and other theories are concerned with that part of stable-state behavior of man which helps him to adapt to new situations in his environment. Man is constantly faced with choice points where he must make a decision. These decisions at the choice points provide him not only with direction for a course of action but also with an immediate knowledge (with exceptions) of the outcome of these decisions. This knowledge of outcomes establishes a repertoire of reference points which tends to stabilize and habituate his behavior. Many studies, concerned with choice behavior in repetitive-choice situations, have shown that as the experimental sessions progressed, the individual's choice behavior, that is, his distribution of choices, begins to exhibit some systematic trend. The individual tends to stabilize



his predictions at about the same proportions in which the choices occur under certain specific conditions of no monetary payoff (Estes, 1954; Siegel and McMichael, 1960).

#### Statement of the Problem

Most aspects of human behavior involve choice. This study is concerned with choice behavior of three different age groups. Three different conditions of a probability learning task are used. The first condition is a random sequence of events; the second condition, a simple pattern of events; and the third condition, a complex or multiple patterns of events. After many trials in making predictions, individual choice behavior appears, stabilizes, and certain strategies become apparent. The problem under investigation is the explanation of choice behavior differences for various age levels differentiated according to Piagetian theory. The strategies used by each age group are indicative of what cognitive processes are available at each stage of development. The three age groups used in this study were selected to include the phases and periods described by Piaget's theory, particularly the concrete operation and formal operation periods. The purpose of the study, then, is to explicate how certain strategies are used and how they seem to be associated with certain stages of cognitive development.



## CHAPTER II

### DEVELOPMENT OF THEORETICAL RATIONALE OF THE STUDY

Choice behavior cannot be conceived as one of the basic psychological processes, since choice behavior reflects the interaction of more fundamental processes such as perception, learning, and motivation. The problem is to identify what factors may be involved and how they may be investigated. Two possible solutions might be the finding of a "true life" situation (Brunswik, 1939, 1943) or the simulation of a situation that is close to the "true life" situation in which most or all of the relevant variables can be controlled. However, the complexity of the problems inherent in a "true life" situation necessitates the use of the analytical approach in an investigation of choice behavior. If making choices is compounded by many elementary behavioral processes, then it may be strategic to select some simple problem in which the relationships of the fundamental psychological mechanisms of choice behavior can be assumed. In this way the mechanisms to be investigated can be isolated and magnified for closer scrutiny.

However, there is at least one limitation to the analytical approach. Is it possible for the researcher to investigate the fundamental psychological mechanisms of choice behavior prior to his discovery and understanding of them? Although this does not invalidate an analytical approach it does require the use of past experience and personal intuition, preconsciously mentation (Miller, 1962), in formulating or accepting a theoretical position that will express what the researcher



hypothesizes choice-making to be.

Making choices involves psychological mechanisms. In this respect the theory of Piaget is very helpful since it presents possible hypotheses and describes mechanisms and behaviors operative during various developmental periods of a child's growth. It also provides certain concepts that help in the investigation of choice-making behavior.

Piaget's work in developmental psychology clarifies some of the cognitive processes integrating perception and thought. As a normal child matures, his primary cognitive processes gradually shift from perceptual centration to thought. This shifting is made possible by "decentration" from the concrete to the abstract through the use of symbols. This is an important concept since it provides some indication of a process which may be used to explain how strategies change with chronological age in choice-making situations. Consequently, it is necessary to review Piaget's theory and explicate how his theory is relevant to the present study of choice behavior.

Piaget has outlined his theory of child development within rather specific time periods. The development of a child's cognitive processes has been divided by Piaget into three periods: sensorimotor (0 - 18 mos.); concrete operations (2 - 12 yrs.); and formal operations (12 yrs. - adult). The concrete operation period is further divided into three phases: (1) preconceptual (2 - 4 yrs.); (2) intuitive (4 - 7 yrs.); (3) concrete operations (7 - 11 yrs.). The ages of the



subjects in this study are within the span of the last two periods. Each age group was selected to be within a particular phase or stage in cognitive development as specified by Piaget's theory. The 4-6 year age group is within the intuitive thought phase; the 7-10 year age group is within the concrete operations phase; and the adult age group is within the formal operations period. The sensorimotor period was not considered in this paper.

Although the preconceptual thought phase (2-4 years) was not investigated in this study, it will be discussed briefly in order to provide some background as to what has transpired in the cognitive development of a child just prior to the intuitive thought phase (4-6 years), the first age group to be studied. The general characteristics of each Piagetian phase or period relative to this study will be fully discussed, followed by an application of Piaget's theory to describe the choice behavior expected at each phase of cognitive development.

#### Preconceptual Thought Phase (2 to 4 years)

Until the child's symbolic processes have developed more fully, much of what he sees is of a transient nature. He may learn to recognize these transient stimulus patterns as "shifting appearances by enduring objects," but this does not mean he possesses a concept of the class. The three-year-old child still lacks the ability to do deductive thinking and has to use something halfway between the concept of a specific object and that of a class. Piaget calls this a "preconcept." Therefore, unlike adults who can reason deductively or inductively, the



child at the preconceptual level must reason transductively; that is, from particular to particular. The child uses a form of argument by analogy: "X is like Y in one respect (attribute), therefore X must be like Y in all other respects." Transduction may often lead to valid conclusions but these are fortuitous and will at other times lead to errors. The child in this stage is very dependent upon perceptual-mechanisms for his information about a particular object, may concentrate on the object, and over time become conditioned to it (Hunt, 1961). Piaget<sup>1945</sup> (1945) has noted also that at this stage of development practice of a skill may have a quality of intentional urgency. He has also noted that this urgency and tendency to practice the skill (in repetitive activities) disappears once it has been "mastered" or organized. It may be that the object of value is replaced by another object of value for the child.

#### Intuitive Thought Phase (4 to 7 years)

This is a transition phase when cognitive manipulations and social communications are being extended, differentiated, and combined into action-images, while correcting intuitive impressions of reality (spaces, causality, etc.). Thought is not yet freed from perception; it is not yet "decentered". The child trusts his perceptions rather than his thoughts since his notions of conservation are not yet developed. Because he continues to be dominated by his perceptions, his conclusions are under the control of the changes in his successive "centerings." "Continued centration" on only some aspects (attributes) of objects and



phenomena results in a tendency to overemphasize the one element while ignoring the relevance of others.

### Concrete Operations Phase (7 to 11 years)

In this phase of development, logical or operational thought appears. As the child interacts repeatedly with his environment of objects, his central processes become more and more autonomous. Basic concepts are used in operational thought which Piaget refers to as internalized actions. Hunt (1961) refers to these "operational" systems of internalized actions as strategies. With this additional ability the child can now decide how to classify, relate, and order in series various objects and phenomena.

However, at this stage, logical operations are still at a concrete level. These operations are analogous to Harlow's "learning sets" and to the operations for information-processing of Hunt (1961), both of which are necessary for strategy in choice-making processes. Piaget (1953) sees logic (strategy) as a reflection of thought and he finds in these logical operations the models that serve to explain what the child can and cannot do at various levels of development. This is a point that Weir (1964) does not consider in his study. The present study attempts to explain how certain kinds of responses (strategies of choice behavior) in a repetitive choice task are associated with certain stages of development.



### Formal Operations (Adult)

Equipped with the capacity for "operational" thinking, the youth can now think about practical problems and concrete situations. In this final phase of development the adolescent moves towards complete "decentration" and "reversibility" which help him to "objectify" objects and phenomena as well as provide him with the capacity for abstract thought. He can now operate on the form of an argument and ignore the content. He is no longer tied to the real but can now consider hypotheses which may or may not be true; that is, use hypothetico-deductive procedures. His ability to theorize and to criticize allows him to try alternative ways of approaching a problem or phenomena. Along with this unfolding of new mental operations is the ability to use combinatorial analyses based on logical structures (strategy). Another new and invaluable intellectual technique which emerges is the calculus of propositions which allows for "second-order operations" or operations on operations. Simultaneously, his capacity to deal with proportionality and probability also develops.

The overview of the epigenesis of behavioral and cognitive processes pictures a progressive incorporation and reorganization of each phase in the subsequent phase, indicative of a hierarchy of information-processing ability.

Berlyne (1957) summarizes the three developmental stages of Piaget in terms which are relevant to our study of choice behavior, as follows:



Children at the intuitive-thought stages vary conditions haphazardly and observe what happens in particular cases without deriving any general principles. At the concrete-operations stage one factor at a time is varied, and its effects are duly noted. Not before the formal-operations stage does the child plan truly scientific investigations varying the factors in all possible combinations and in a systematic order (Berlyne, 1957, p. 319).

It is important to note that during the period of concrete operations, the child is able to form a value system. This system of values he systematizes according to "relative priorities" in a consistent manner. He is able to postpone his immediate pay off for future pay off through his "decentrating" ability. We call this an expression of will. He can now bypass "symbolic games" for "games with rules" which provides a basis for the emergent moral rules and eventually logic.

Although Piaget does not agree with the "associationist" or "conditioned reflex" theorists, many of his reported observations tend to harmonize his theory with conceptions of learning based upon "operant conditioning," especially in the earlier phases of cognitive development. Berlyne (1957) states:

The sequence of more and more complex behavior patterns which he (Piaget) depicts as outgrowths of simple reflexes and habits parallels Hull's list of progressively more intricate adaptive behavior mechanisms...Piaget's view of images and thought operations as internalized event responses approximates very closely the view prevalent among S-R learning theorists...(what) Piaget is eagerly endeavoring to bring into relation with his own findings is that centering on cybernetics information theory and game theory (Berlyne, 1957, p. 323).

Now we shall apply Piaget's theory to a repetitive choice



situation and point out the kinds of choice behavior that would be expected of the various age groups, particularly of those age groups that will be studied in this investigation.

#### 2-4 Year Age Group

Since the child's choices are based upon transduction and immediate perceptions, he uses only those dominant aspects (attributes) of the object or phenomenon upon which he has centrated. The act of repeating an activity which has become the "center" of his interest should result in decisions for and persistence in repetitive choice situations, especially if pay off is received. Members of this age group have a short attention span and are very easily diverted from short range goals. Their short attention span and ease of distraction causes them to "tire" quickly of their repetitive response and discontinue and centrate on some other activity. Unless someone prods them to continue or causes them to attend again, they will abandon the task. Therefore, when prodded, they continue from the point of diversion. Seemingly, they behave as if they cannot do otherwise. Why? The answer appears to be in their inability to decentrate; or it may be because they do not have the schema, the concepts, or the symbols that are required in a higher order of operations.

#### 4-6 Year Age Group - Intuitive Phase

The child in this phase will make much the same kind of choices as the child in the preconceptual phase, since he does not yet have the



ability to "decentrate" from the attributes that dominate his perceptions. He too will trust his perceptions because of his "centration". Thus, over time, he should gradually become conditioned to them. In a repetitive choice task, as soon as he acquires a notion of which event will yield the most reward, he should centrate on that event and persist in choosing it. On the basis of his experiences he will, therefore, display a strategy that provides immediate tangible pay off, in order to recognize immediate or short-range goals. The choice behavior is still influenced to a very large extent by the results of the event that has immediately preceeded the choice. His abilities, therefore, prevent him from a higher order of operations with the result that he will be unable to differentiate a random sequence of events from a patterned sequence of events. As already discussed, Piaget's theory (1947) would suggest that during the intuitive period, when the child finds that he receives very little success from the less frequent event (or events), he accommodates to the most frequent event. The result is that he "centrates" on this event and fails to look for patterns. Piaget's theory also suggests that the child of this age is still in the pre-operational stages and therefore may not have a schema for response patterns and thus be unable to operate at a higher level.

#### 7-10 Year Age Group - Concrete Operations Phase

In this phase, the child's abilities allow him to observe his environment, to formulate hypotheses about its operations, and to try to verify them by his operations. His decisions still depend upon



reality as he sees it. When required, he looks to nature for his cues in order to establish a strategy for action that will match events in nature. He learns from these events in nature and is captivated by them, trying to unfold their principles. As he meets with some success from his choice behavior, he is sure he will have total success. His inability to abstract from the concrete, however, limits his success. His behavior is highly exploratory; he decides on a strategy, tests it, and if he finds his strategy incorrect, he forms another. However, rather than abstracting a more general hypothesis his strategies still deal with the concrete rather than the abstract. Thus, in a repetitive choice task, we would expect the child to reveal the distribution of his choices in a manner which would indicate that he is matching the event probabilities with his proportion of possible responses (mixed strategy). In other words, he mimics the environment as he attempts to understand the concrete.

#### Adult Age Group - Formal Operations Period

During this final stage the individual has the capacity for "operational" thinking; he can think about practical problems. His ability to "decentrate" allows him to consider various relevant aspects of an object or a phenomenon. He now has a schema for a pattern from which he can deduce from his observations in a repetitive choice situation whether or not the events are patterned. If he concludes the events to be random, his capacity for proportionality and probability allows him to estimate the frequency of each event. These subjective



estimates provide a basis whereby he should be able to decide either to choose consistently the most frequent event (pure strategy) or to try some other combination of choices (mixed strategy). Should his considerations give him reason to hypothesize, or conclude, a patterning of events, he should now be able to try to solve the problem of what is the nature of the pattern; that is, its base (over how many trials does it repeat itself) and its sequence. Finally, he should be able to learn not only the pattern but also be able to persist in responding to it (patterned response strategy) and thereby obtain a perfect number of choice responses. Where a reversal shift occurs in the pattern, Piagetian theory would indicate that his hypothetico-deductive procedures allow him to make the necessary adjustment in his choice behavior very quickly. Whatever his conclusion about the conditions of the repetitive choice task, he can use any one of a number of ways of maximizing his expected utility. This ability to apply an appropriate strategy is facilitated by being able to abstract from experience the elements which are relevant to success (pay off). Reversibility, the ability to retrograde or invert (Flavell, 1963), as it were, over an already completed sequence, allows him to plan and modify strategy to maximize his expected utility. This abstract thinking further allows him to make short range as well as long range goals. This ability to arrive at and apply a strategy greatly enhances his choice behavior.



### Siegel's Work - Strategies, a Useful Tool

Germane to this study are the postulates and assumptions that when placed in repetitive choice task situations individuals will: (1) try to maximize expected utility; (2) reach an asymptotic level of choice behavior after a number of repeated trials; and (3) indicate the strategy of maximization of expected utility by the asymptotic level of choice behavior. It is also assumed that these strategies will help to differentiate between age groups in their choice behavior; that the cognitive development of the age group dictates the kinds of strategies available to them; and that the results of repetitive choice behavior can be explained in terms of Piaget's theory of cognitive development.

Some of these postulates and assumptions are based on the work of Siegel (1959) in decision-making theory. Much of his research and that of his collaborators is concerned with choice behavior in a variety of problem-solving and probability-learning tasks and is therefore applicable to the present study. The terminology is precise and fruitful in designing as well as reporting and interpreting data. The terminology also has the value of focusing the attention of the investigator on environmental and behavioral variables and consequently aiding in the investigation of choice behavior.

Any comprehensive theory, such as that of Siegel, must be able to account adequately for the contribution of different relevant variables (factors) involved in human repetitive choice behavior. Because of



their restrictive assumptions based upon game theory (von Neumann and Morgenstern, 1947) and statistical learning theory (Estes 1950, 1959), some theoretical approaches to choice behavior have been inadequate for explaining human choice behavior. However, predictions of asymptotic levels of choice behavior obtained by using the decision-making theory model of Siegel (1959) and McMichael (1960) have been successful in dealing with the problem of one-person game situations where the amount of reward and amount of variability are varied (Siegel and Goldstein, 1959; Radlow and Siegel, 1960; Siegel and McMichael, 1960; McKendry, 1961).

Siegel (1959) incorporates three factors in his first model of stable-state behavior: "(1) the proportion of times the subject chooses the more frequent event, (2) the marginal utility of a correct prediction, and (3) the marginal utility of variability." Gaberman (1962) and Siegel and McMichael (1960) have generalized this model to include the effect of differential pay-offs; that is, the amount of reward for any of the events.

The general assumption underlying the Siegel decision-making theory approach is that subjects will attempt to maximize expected utility. One specific assumption of Siegel's model is that when there is an increase in reward of the correct prediction there is also an increase in its marginal utility; and/or when there is additional increase of the variability within the task there is a decrease in marginal disutility or a decrease in boredom (Sloan and Zurcher, 1953)



associated with the repeated response, and thus an increase in the tendency to maximize the probability of the prediction. The general approach of Siegel's theory is expressed in the hypothesis that:

....the asymptotic probability of a person's predicting the occurrence of the more frequent event in a two-choice uncertain-outcome situation is a function of the levels of reward present in the situation, such that the probability of predicting the more frequent event will tend toward unity as the rewards (positive utility) and costs (negative utility) of correct and incorrect predictions are increased (Messick and Brayfield, 1964, p.159).

According to Siegel's theory, in a repetitive-choice situation, regardless of the strategy or strategies used in the prediction, the subject's behavior will eventually reach a stable-state or asymptote. At this stable-state, the long-run proportion of times in which the subject will choose a particular alternative is his choice probability for that particular alternative and the proportionate distribution of the subject's choices at this stable-state represents his strategy. There appears to be a systematic change, an incremental learning (Skinner, 1938; Hull, 1943; Estes, 1949; Jarvik, 1951), in the probability of correct prediction as a function of continued experience with the event probability. Messick and Solley (1957) called this probability learning. Probability learning seems to be asymptotic between 200 and 300 trials (Siegel, 1964) and appears then to remain quite stable. The point at which the asymptote would tend to fall off or otherwise change has not been investigated.

The theoretical rationale has been presented in this chapter. The rationale for this experiment has emphasized the importance of



cognitive development on choice making and has suggested the expected choice behavior that may be explained according to Piagetian theory. Through reference to the work of Siegel, the importance and the relationship of strategy to probability learning was pointed out. Further, some of the general features of the processes involved in choice behavior were identified.

The following chapter discusses some related studies and stresses the role of additional factors in choice behavior.



## CHAPTER III

### RELATED STUDIES AND THE ROLE OF OTHER FACTORS

#### IN CHOICE BEHAVIOR

There are many studies that support the notion that there is a definite tendency (both in the young and older subjects) to "maximize probability" of reward in predictions. Supporting studies in this area, using adult college students (Brunswik, 1951; Hake and Hyman, 1953; Humphreys, 1939; Jarvik, 1951), as well as with young children (Messick and Solley, 1957; Stevenson and Weir, 1959; Stevenson and Zigler, 1958; Weir, 1962; Kendler and Kendler, 1962), show that these subjects do tend to maximize.

Jones and Liverant (1960) give further support with their finding that younger subjects (4 to 6 years) showed more maximization by utilizing "pure" strategy in a two-choice task than did the older subjects (9 to 11 years). This "pure" strategy that occurs early in performance is indicative of fairly "primitive problem-solving behavior " (Weir, 1964).

Weir (1964) studied performance, in a problem-solving task, of subjects at various age levels from 3 to 20 years. He assumes that the differences in performance at different age levels and at different points during the task reflect the hypothesis and the strategies of the subjects. He describes a U-shaped relationship between age and terminal level of correct response and an inverted U relationship between age and simple patterns of response. The younger group of



subjects, 3 to 5 years of age, also showed a more rapid rise to a terminal level of response than did both of the older groups of subjects, 7 to 11 years and 15 to 20 years. He attributed these differences to the effects of the subjects' growth and development. Weir also noted that the youngsters (3 to 5 years) behaved approximately the same as the adult group. In the light of Piaget's theory there seems to be little doubt that different processes must have led to the final level of terminal responses.

Effective choice behavior involves the ability to perceive and evaluate relevant information and then to select the particular course of action (strategy) that seems the most likely to meet both the demands of the situation and the overall needs of the individual (expected subjective utility). Many choices become habitual and automatic. Once effective ways have been found to handle routine problems of everyday living, little or no thought is devoted to them. There are many situations, however, which require a fresh and creative approach on the part of the individual.

#### Role of Other Factors in Choice Behavior

Basic to effective choice behavior in new situations is the clear perception of the alternatives and the universe of possible events. But this is not all. Other factors affect choice, such as faulty assumptions, disabling attitudes, rigid mental set, ego-defensive orientation, stress and emotion, and a tendency to oversimplify the complexity of the complex situations (Coleman, 1960). Along with



these, there are certain other factors which warrant recognition and discussion.

### Verbal Processes - Language

Bruner (1964) points out the importance of internalized language as a cognitive instrument by which it becomes possible for a child to represent and to transform systematically the regularities of experience with greater "flexibility and power." In his study on conservation, he states that a child "must have some internalized verbal formula that shields him from the overpowering appearance of the visual displays." In other words, cognitive symbolization is necessary to properly objectify the elements of an experience or observed phenomenon before any cognitive groups and operational systems can take place. It follows that a young child (4 to 6 years) who may not be able to verbalize about the elements of an experience or observed phenomenon is limited in the level at which he can cognitively process information. This in turn will limit his conclusions and decisions for actions about the nature of the phenomenon perceived. Recent Russian literature (Vygotsky, 1962; Luria, 1961) has also called attention to the so-called second-signal system which replaces classical conditioning with an internalized linguistic system for shaping and transforming experience itself.

Kuenne (1946) suggests that:

... there are at least two developmental stages so far as the relation of verbal responses to overt choice behavior is concerned. In the first, the child is able to make



differential verbal responses to appropriate aspects of the situation, but this verbalization does not control or influence his overt behavior. Later, such verbalizations gain control and dominate choice behavior (Harper, et al, 1964, p. 637).

This implies not only that acquisition of verbal processes (language) can affect the transition to behavior dominated by such processes, but also that in a probability learning situation the child's responses, discriminations, response patterns, etc. become keyed to words relating to the cue aspect of the stimuli (Keunne, 1946).

#### Expectancy Set for Complex Solutions

In a typical probability learning study an important factor in the subject's choice behavior should be "pre-conceptions or sets" that the subject brings with him, for all he is told is to predict which of two or more events will occur or to choose between two or more events. One factor indicated by Weir (1962) that results from pre-conceptions or sets may be "the frequent occurring patterns" which he observed in his study.

The older subjects (7 - 10 years), and particularly the adults, enter a two-choice task with a strong expectancy set (Zajonc, 1955; Cohen, 1961) that there is a solution which will give 100 per cent reinforcement (reward), with 100 per cent predictability of whether a reward will be delivered or whether it will not be. Consequently, these subjects employ complex strategies based upon complex hypotheses about the nature of the task and reward schedule (Weir, 1964). Apparently younger children are not concerned with, or are incapable of,



constructing such complex hypotheses and consequently respond on some different basis. Some of the possible bases for this response are presented earlier in this paper in the discussion of Piaget's theory.

The expectance of complex solutions displayed by older subjects (7 to 11 years) is strongly entrenched and difficult to overcome. Hyman and Jenkins (1956) found it difficult to convince subjects that a particular sequence of events was random rather than structured. Supporting evidence (Morse and Runquist, 1960) for the notion that subjects will be more inclined to use matching behavior (non-maximizing) is more common if the subject believes that the experimenter has pre-scheduled a series of events. Gruen and Weir (1964) found similar evidence when they investigated the use of instructional sets concerning randomness and non-randomness.

The expectancy of the older subjects (13 years and college age) that there is a complex solution actually motivates them to behave in such a way that they seem to choose the more frequently reinforced alternatives less often. As a consequence, subjects that choose to behave in a more complex fashion receive a lower frequency of reinforcement than do subjects who behave in a less complex manner (Kendler, 1963; Stevenson, Iscoe, and McConnell, 1955; Weir and Stevenson, 1959).

### Response-Hypothesis Orientation

Goodnow and Pettigrew (1956) suggest a "response-hypothesis orientation" very similar to the Russian research of the "what is it?" (chto takoe) reflex (Pavlov, 1927) to account for the difficulty in



simple pattern learning which may be actual or hypothesized. According to them, this means that:

The Ss use their choices as direct tests of specific hypotheses rather than as tools for data gathering with hypotheses testing held in abeyance. As a result, the information gathered is related to a specific hypothesis, and if the latter should prove to be wrong, it is only with difficulty that the information can be transformed and made relevant to another hypothesis. As a rule, subjects do not transform information but start from scratch again with their next hypothesis (Goodnow and Pettigrew, 1956).

Whether the search for response patterns is due to exploratory drive (Berlyne, 1960) of the middle age group (7 to 11 years) or to "response-hypothesis orientation" of the oldest group (13 years or older) the result is the same: it results in lowered reward for both groups.

This type of behavior (search for possible response patterns) for the middle group (7 to 10 years) may have a utility of variability that has a greater value than the utility of reward. They may be trying to seek information for "information sake" or just may be trying to "beat the machine." As a result, they would continue to persist in this type of behavior, in spite of the lowered reward. If this is so, then keeping variability constant or low and increasing pay-off should result in an increase in maximization behavior. Or, conversely, increasing variability should decrease the disutility of boredom and increase maximization behavior (Siegel and Andrews, 1964). At first, the oldest group (adults) may be expected to behave in a similar manner; that is, to look for possible "perfect" solutions. However, after a time it may be expected that the oldest group should abandon this search for patterns and turn to



the higher level of abstraction for their response behavior. Weir (1964) states:

... It seems reasonable to assume, then, that the older subjects (the 18-year-olds) for example, enter this task with complex hypotheses concerning solution, employ complex strategies, systematically reject these strategies when they do not provide a solution which meets their expectation, and finally arrive at something very close to an actual game solution. That is, they eventually begin to realize that two of the buttons have nothing to do with the game and begin to maximize their choice of the only alternative that ever pays off. But this maximizing strategy comes about as a consequence of a vastly different process than does the maximization shown by the three and five year-olds (pp. 478, 479).

Applying Piaget's theory to the behavior of the middle group (7 to 10 years), an increase in variability or an increase in pay-off should cause the subjects to abandon or "decentrate" their search of response patterns, to attend to, or "centrate" on the increase in variability or pay-off, and in this way increase maximization behavior.

Thus far there appears to be a reasonable explanation for the behavior of the younger subjects (4 to 6 year-olds) and for the eventual maximizing tendency of the adults. However, the middle group (7 to 10 year-olds) with its search for response patterns and its low terminal levels for correct response is much more difficult to explain. Therefore, it is necessary to more thoroughly scrutinize the strategies employed by these subjects.

### Response Patterns

In perceiving the environment, the idea of randomness is almost alien to the human mind (Cohen, 1960); our mental activity is characterized



by a search for order and meaning. Most persons, in making predictions, have some "system ranging from very simple to highly complex."

The most "common response pattern used in this task (at least for some ages) involves some variant of a left, middle, right (LMR), or as right, middle, left (RML) scheme" (Weir, 1962). In a later study (Stevenson and Weir, 1963) the Ss who believed there was a solution to the task also believed that the solution would involve some sort of patterning and acted as if they were attempting to find the pattern that would solve the problem. This was no doubt partly due to the nature of the apparatus.

An inverted U curvilinear relationship between age and performance appears in LMR and RML patterns. Weir's statistical analysis seems to indicate that patterns of the simple LMR and RML nature are less likely to portray the choice behavior of the younger children (3 to 5 years) and the older group (17 years up) than of the middle age group (9 to 10 years). The 3 year-olds virtually never use these patterns; the older group (17 years and up) use them at the beginning of the task, but soon drop them; the middle group (9 to 10 years), however, tended to use patterns rather consistently throughout the task.

Two explanations for the behavior of the middle age (9 to 10 years) children seem plausible. Either this middle age group is incapable of using (or do not have) more complex patterns when the simple patterns fail, or they are for some reason unable to accept the failure of the simple patterns and continue to respond in a fairly stereotyped fashion.



It may also be that a combination of both factors is partially responsible for the behavior of these middle range children.

According to Piaget's theory, middle range children (7 to 10 years) are still in the concrete operations period and therefore not equipped to function on a formal operations level. Although they may be able to form the simpler hypotheses they are still very much "centrated" on the concrete. The ability to abstract from experience and to form complex hypotheses comes later in their development. During this period they are in a transitional state, slowly moving from the concrete towards the formal operations. Many of their abilities (such as hypotheses-formation, analyses, syntheses, etc.) are not sufficiently coordinated for abstract thinking.

Studies involving a two-choice task for different age groups, ranging from 3 to 4 years of age (Kessen and Kessen, 1961); 5 to 9, and 13 years of age (Craig and Myers, 1963); 6 to 9, and 11 years of age (Gratch, 1959); and 15 years of age (Ross and Levy, 1958), although differing in tasks and reward, allow the examination of response patterning behavior among different age groups. When the data are combined, the apexes of the two-response curve and that of the three-response curve suggest that when the number of choices are reduced from three to two, stereotype pattern behavior appears at an earlier age. This supports the notion that complex hypothesis formation ability and/or information processing capacity develop at a different time.



In the three-choice task, the increased complexity of LMR and RML patterns may be beyond the capacity of these middle age (7 - 10 years) subjects to process all the possible information gained from knowledge of outcomes. Information from previous response patterns may not be used because they are unable to remember the long and complex series of responses from which information about the success or failure of events is processed. If it is impossible to recall these long series of responses, then a return to some type of basic patterning is understandable. If this stereotype pattern is due to inadequate recall, then allowing the subjects to record the results of the events and their responses should reduce pattern stereotype.

#### Reversal-Shift of Pattern

Kendler and Kendler (1962) have suggested that reversal shift behavior is relevant to response patterns. In their experiments they found that after relatively few trials (6 mean number of trials) the younger subjects (3 to 5 year-old fast learners) are capable of reversal shifting just as quickly as are the adult group. This appears to be a recentering of attention with each shift; there was no long term centration. It is supposed by the researcher in this study that after 200 or even 140 trials the younger subjects should be conditioned to a response pattern and that after a reversal shift of M F E frequencies the younger subjects should, because of the long term centration, persist in the previous pattern for a longer period than the adult subjects over the remaining 100 trials.



### Psychological Probability

The subjective theory of probability which deals with a measure of the individual's confidence in the truth of a particular proposition is utilized by Cohen (1960) for his theory of psychological probability. Cohen attempts to explain those random responses which are not logical, and do not depend solely on information or facts, but are based on a host of purely personal factors. Because of this there are no "errors" in psychological probability, only phenomena or tendencies. In the usual statistical context, these "break-aways" from the expected behavior are considered to be error. It deals with how people actually behave and not with how they should behave.

Psychological probability changes in a systematic fashion from one stage of mental development to another. Children's predictions at different ages indicate the extent to which they have reached the stage for utilizing this sort of statistical relationship. In children of 9 and 10 years of age the estimates decline when the number of hypothetical attempts increases. Psychological probability is concerned with "learning how to learn" from the learner's point of view (Cohen, 1960).

### Sex Differences

There seems to be no concrete evidence that there are sex related differences in any reported studies of probability learning. It may, however, be noted that:

There are major differences between the sexes in rate of development, which although present during childhood



are most obvious during adolescence. It is generally agreed that girls mature mentally and physically earlier than boys do (Powell, 1966, p. 8.).

Piaget's observations do not account for any sex differences since their major emphasis is on chronological developmental levels. Any sex differences to be found in this study would be expected to be due to maturational differences.



## CHAPTER IV

### DEFINITIONS, POSTULATES, ASSUMPTIONS AND HYPOTHESES

In order to make the definitions more meaningful for the reader at this point a brief general description of the task in this experiment follows.

Three treatments were used in this experiment. In each of the three treatments the task was a three event probability learning task. The  $i$ th event has a fixed probability of occurrence  $\Pi_i$ . When  $i$  represents the most frequent event, then  $\Pi_i = .70$ . The probabilities of the other two events were 0.2 and 0.1 respectively, except in Treatment III when the fixed probabilities change.

A choice point is indicated by the illumination of the signal lights, signalling to the subject that he should make a prediction. A trial is initiated by the illumination of the signal lights and includes the subject's prediction made by pressing the black button on the base of the panel corresponding to the event light which he predicts. Within a few seconds, illumination of one of the event lights indicates the correct response to the subject. A large number of such trials in blocks of 20 trials succeed one another in the series.

#### Definitions

1. event - is the illumination of a red light.
2. alternative - is the course of action open to the subject represented by the choice of buttons before him, one button corresponding to each of the three possible events.



3. choice point - is a signal which signifies to the subject that it is time for him to make a prediction concerning one of three possible events.
4. choice - is the subject's expression of his prediction of an event made by pressing the appropriate button.
5. trial - is initiated by the choice point signal and includes the subject's prediction, the subsequent illumination of one of the event lights accompanied by the subject's observation of this event, and any payoff to the subject.
6. trial block - is a specified subset of the total series of trials. In this study the subset consists of 20 trials.
7.  $\Pi_i$  - is the fixed probability of occurrence of the  $i$ th event in successive trials. ( $i = 1, 2, \text{ or } 3$ )
8. most frequent event (MFE) - is that event which has the highest probability of occurring in a series of trials.
9. correct response (CR) - is a prediction which is confirmed by the event which follows it.
10. outcome - is the subject's experience of a correct or incorrect response.
11. utility or subjective value - is the intrinsic worth of an outcome to an individual.
12. expected utility - is the expectation of the utility of the outcome.
13. marginal utility of a correct choice - is the value subjectively assigned to a correct response.



14. stable state or asymptotic level - is the proportion of times a subject chooses each of the alternatives within defined final trial blocks.
15. strategy - is the proportionate distribution of the subject's choices at the stable state.
16. mixed strategy (matching strategy) - is a condition of behavior said to exist when the proportionate distribution of the subject's choices of each of the possible alternatives is equal to, or matches, the probabilities with which the events occur.
17. pure strategy - is the relatively stable state of predicting the most frequent event on all trials.
18. patterned response strategy - is said to exist when the proportionate distribution of the subject's choices has one to one correspondence with the sequence in which the events occur.
19. random (treatment) - describes the order in which the events occur randomly over the successive trials.
20. simple (treatment) - describes the order in which the events occur in a repeating pattern over specified numbers of trials.
21. multi-pattern (treatment) - describes the order in which the events occur such that more than one pattern simultaneously repeated over a series of trials and whose  $\Pi_i$ 's when added are greater than unity.
22. recovery curve - represents the plotted means of those trial blocks necessary for subjects to return to the previous asymptotic level of predicting the MFE after a reversal shift of the MFE has taken place.



### Postulates

1. As a normal child develops chronologically his primary cognitive processes gradually shift from perceptual centration to thought.
2. The phases of cognitive development as designated by Piaget dictate the abilities that are available to the child as he tries to maximize his expected utility.
3. Piaget's division of the period of concrete operations into phases as well as his period of formal operations can be used as criteria for selecting the three age groups of this study as follows:
  - (a) intuitive thought phase - (4-6 age group) - during this phase, the child is dominated by his perceptions, and continues to "centrate" on attributes of objects and phenomena at the expense of excluding other relevant attributes.
  - (b) concrete operations phase - (7-10 age group) - during this phase logical thought appears, but it is tied to the concrete level.
  - (c) formal operations period - (adult group) - during this period, the subject is provided with abilities to work cognitively on practical problems and concrete situations. In this final stage he has the ability to "decentrate", to "reverse", to "specify" and to think abstractly.
4. The choice behavior after the subject has arrived at a relatively stable state designates the strategy that has been adopted to maximize his expected utility of a correct choice.



5. Strategies provide an indication of the cognitive processes that are operative in a problem solving task and these strategies will provide a separation of the groups according to the abilities available to them.
6. Female subjects mature more quickly than do the male subjects; therefore, sex differences in any, will be due to earlier maturation.

#### Assumptions

1. The marginal utility of a correct choice is the same for all the alternatives.
2. There is little, if any, systematic effect upon the group results from the utility of gambling, since the utility of gambling is positive for some people and negative for others.
3. All subjects will adopt a strategy which tends to maximize the total expected utility of their behavior in the situation.
4. A subject will derive satisfaction and/or dissatisfaction from the outcome of each trial.

#### Hypotheses

This study is concerned with choice behavior of three age groups under three different conditions of a probability learning task. The first condition is unstructured and the sequence of events is random. The second condition is simply structured but its sequence of events is a single pattern. The third condition is a complex structure of multiple patterns of sequences of events.



The purpose of this study is to explain how certain strategies are used and how they seem to be associated with certain stages of cognitive development.

The hypotheses tested were based on the theory that has been discussed. According to theory all subjects should try to maximize their subjective expected utility but there should be differences in strategies employed between the three age groups: 4-6 years; 7-10 years; and adults. In Treatments I, II and III, 3-event frequencies were programmed as: (1) randomized; (2) single simple pattern; (3) multiple patterns, respectively. The three treatments vary in the patterning of events, with each treatment designed to distinguish between age groups as to what kind of strategies are used and why these strategies are employed. Maturation should be an apparent factor between the groups. All treatments are to be under the condition of rewards, for which utility is assigned by the subject himself. In each treatment sex differences will be considered.

Under Treatment I - (Random)

- Ho. 1 (a) The 4-6 year age group will behave as if they are using pure strategy; the adults will use predominantly pure strategy; the 7-10 year age group will use mixed strategy.
- Ho. 1 (b) The order of reaching the asymptotic level will be the following: first, the youngest group; second, the adult group; and third, the middle group.
- Ho. 1 (c) The adult group and the females in the 4-6 year age group



will precede the males in reaching the asymptotic level of behavior because of maturation.

Under Treatment II (Simple Pattern)

- Ho. 2 (a) The 4-6 year age group will not respond at any time to patterns but behave as if they were applying "pure strategy"; the 7-10 year age group will apply mixed strategy - they will try to locate the response patterns but will not be able to persist in them; the adult group will locate the response pattern and will continue to use a patterned response strategy.
- Ho. 2 (b) In the reversal shift, after 140 trials for the 4 to 6 year age group and 200 trials for the two remaining groups, the 4 to 6 year age group will take longer than the adult group in the recovery of their response to the MFE because they have "centrated" on it and have become conditioned to their first response pattern. The middle group will continue with the mixed strategy as before the shift.
- Ho. 2 (c) Sex differences will be non-significant.

Under Treatment III (Multiple Patterns)

- Ho. 3 (a) The 4 to 6 year age group will behave as if they were applying "pure" strategy with the result that they will persist to choose the event they have "centrated" on in the early trials. The adult group will apply "pure" strategy after abandoning mixed strategy. The 7 to 10 year age group will vary



considerably as they try various response patterns, resulting in a much lower number of correct responses.

Ho. 3 (b) Sex differences will be statistically significant on the 10th trial block (trials 181-200) for the two younger groups, favoring the females in the number of correct responses made because of earlier maturation.



## CHAPTER V

### EXPERIMENTAL DESIGN AND PROCEDURES

#### The Design

This investigation was designed to study the behavior of three age groups under three treatments, over a series of blocks of repeated trials, in a probability learning task. The number of subjects of each sex in each age group, and in each treatment, was equal. The assignment of subjects to treatment was random at the time of the experiment. Two hundred seventy subjects were used to give an N of 15 in each of 18 possible cells. (See Tables I and II on the following page.)

There were four independent variables under investigation in this research:

1. Age of subjects: four-to-six years; seven to ten years; adults
2. Treatments: random, single pattern, multi-pattern
3. Sex of subjects
4. Trials: four-to-six year age group, ten blocks of twenty trials; the other two age groups, fifteen blocks of twenty trials.

These variables were considered in various  $p \times q \times r$  factorial designs where  $r$  was the number of trials of repeated measures in each analysis.



TABLE I  
AGE GROUPS AND TREATMENTS  
(270 SUBJECTS)

Groups	Treatment I (Random)		Treatment II (Simple pattern w/reversal shift)		Treatment III (Multi-pattern)	
	Male	Female	Male	Female	Male	Female
A (4-6 years)	A <sub>1</sub> (15)	A <sub>1</sub> (15)	A <sub>2</sub> (15)	A <sub>2</sub> (15)	A <sub>3</sub> (15)	A <sub>3</sub> (15)
B (7-11 years)	B <sub>1</sub> (15)	B <sub>1</sub> (15)	B <sub>2</sub> (15)	B <sub>2</sub> (15)	B <sub>3</sub> (15)	B <sub>3</sub> (15)
C (Adults)	C <sub>1</sub> (15)	C <sub>1</sub> (15)	C <sub>2</sub> (15)	C <sub>2</sub> (15)	C <sub>3</sub> (15)	C <sub>3</sub> (15)

TABLE II  
 $\Pi$ 's\* FOR AGE GROUPS AND TREATMENTS

	E <sub>1</sub>	E <sub>2</sub>	E <sub>3</sub>
Treatment I (Random)			
Group A (4-6 years)	.7	.2	.1
Group B (7-11 years)	.7	.2	.1
Group C (Adults)	.7	.2	.1
Treatment II (Simple Pattern)			
Group A (4-6 years)	.7	.2	.1
Group B (7-11 years)	.7	.2	.1
Group C (Adults)	.7	.2	.1
Treatment III (Multi-Pattern)			
Group A (4-6 years)	.7	.3	.5
Group B (7-11 years)	.7	.3	.5
Group C (Adults)	.7	.3	.5

\* = Fixed probabilities of occurrence of events.

k

$\sum_{i=1}^k$   $i=1$ , and, greater than unity for Treatment III, the  $\Pi_i$ 's are not linearly independent.



Treatment I (random) provides the basis for studying the choice behavior of three age groups in a probability learning task whose sequence of events are not patterned (unstructured) with regard to: (a) the kind of strategies employed (hypothesis 1a); (b) the possible effects due to maturation (hypotheses 1b); (c) and the possible effects due to sex (hypothesis 1c).

Treatment II allows the study of choice behavior in a similar task where the sequence of events are patterned (structured). The patterned sequence of events provides for the study of not only the strategies used, but also for the study of the cognitive ability of the various age groups to detect, to learn and to use a patterned response strategy. The effects of a reversal shift on the choice behavior in the three age groups after some learning and/or conditioning has taken place was also studied. Conditioning due to centration is hypothesized only for the 4-6 year age group. Hypotheses 2(a), (b) and (c) are to be tested in this context.

Treatment III (multi-pattern) is a patterned, complex probability-learning task. It provides the basis for the investigation of choice behavior when competing patterns are presented. Here, hypotheses 3 (a) and (b) are tested.

For all three treatments the best description of choice behavior of each group for each possible event for each trial block is the response mean. Learning or response curves are generated by plotting the means for each successive trial block. Strategies may



also be inferred from these plotted means.

As the subjects become aware that one event is more frequent than the others, and that there is some sort of proportionate relationship between events, their choice proportions,  $P_i(t)$ , change from block to block until they settle at a stable state. Thus after, say, 100 trials or more, subjects may settle on a stable pattern of choices; for example, choosing the left light on  $p_1 = .75$  (75%) of the trials in each block, the middle light on  $p_2 = .15$  (15%) of the trials in each block and the right light on  $p_3 = .10$  (10%) of the trials in each block. These stable-state choice proportions are said to represent the subjects' observed strategy.

To the degree that the mean for each possible event within a trial block matches the fixed probability of those events, then to that degree a mixed strategy is inferred. If the means do not match the fixed probabilities and the subject consistently chooses MFE, then pure strategy is inferred. Different strategies produce different outcomes.

To estimate the point at which the asymptotic level had been reached, two regression lines (the second having a slope of zero) were fitted to the plotted means of the response curves and the error sums of squares per point noted. When the slope of the second line was zero or near zero the point of intersection of these two regression lines was used to estimate the trial when the stable state began.

In order to test the hypotheses an analysis of variance was used to test the differences. These were considered significant at



the .01 level.

### The Sample

To obtain a sample of sufficient number in each age group it was necessary to utilize a variety of sources. Of the 108 subjects in the four to six year age group, 97 were from day nurseries or nursery schools in Edmonton, Alberta, while the remaining 11 children were from the Seventh-day Adventist camp meeting at Lacombe, Alberta. Of the 103 subjects of the seven to ten year age group, 85 were from the Seventh-day Adventist camp meeting in Lacombe, and 18 were from the Edmonton Community League playground. The adult group were almost entirely from Edmonton. Sixty-seven were University of Alberta summer school students, 27 were Royal Alexandra Hospital School of Nursing students, and 8 were from either Edmonton or Lacombe, Alberta. A more complete analysis of the sample may be found in the appendices (see Appendix A, page 121).

The mean age for the four to six year age group was 5.0 years; the mean age for the seven to ten year age group was 8.5 years and their mean attendance at school was 3.5 years. The adult group had a mean age of 23.0 years and a mean attendance at school of 14.66 years.

The assignment of subjects to either of the three treatments was random, as they appeared for their appointments.

In preparing the final sample for statistical analysis, the groups were equated for number in each cell as well as for sex. This necessitated the deletion of some subjects by using a table of random



numbers.

### The Task

In this experiment a three-event situation was used. The choice point was indicated by the signal light, which came on, signifying to the subject that he should make a prediction. A trial was initiated by the illumination of the signal lights and included the subject's prediction, which was indicated by his pressing the black button on the base of the panel which corresponded to the event light which he was predicting. Within a few seconds, illumination of one of the event lights indicated the correct response to the subject.

A large number of such trials succeeded one another in a series. Ten blocks of twenty trials each succeeded one another in the series for the four-to-six year age group and fifteen blocks of twenty trials were used for the other two age groups.

In all three treatments the task was the same in the sense that the subject was seated at the work station (see Figure 1, page 45) and asked to try to predict which of the three possible events would occur in each trial. Event one ( $E_1$ ) was on the left (L), event two ( $E_2$ ) was in the middle (M), and event three ( $E_3$ ) was on the right (R) of the work panel. The sequencing of events differed for each treatment. Each work station (Figure 1) had three signal lights (amber) at the top, three event lights (red) on the slanting face of the panel, and three black buttons at the base of the panel.



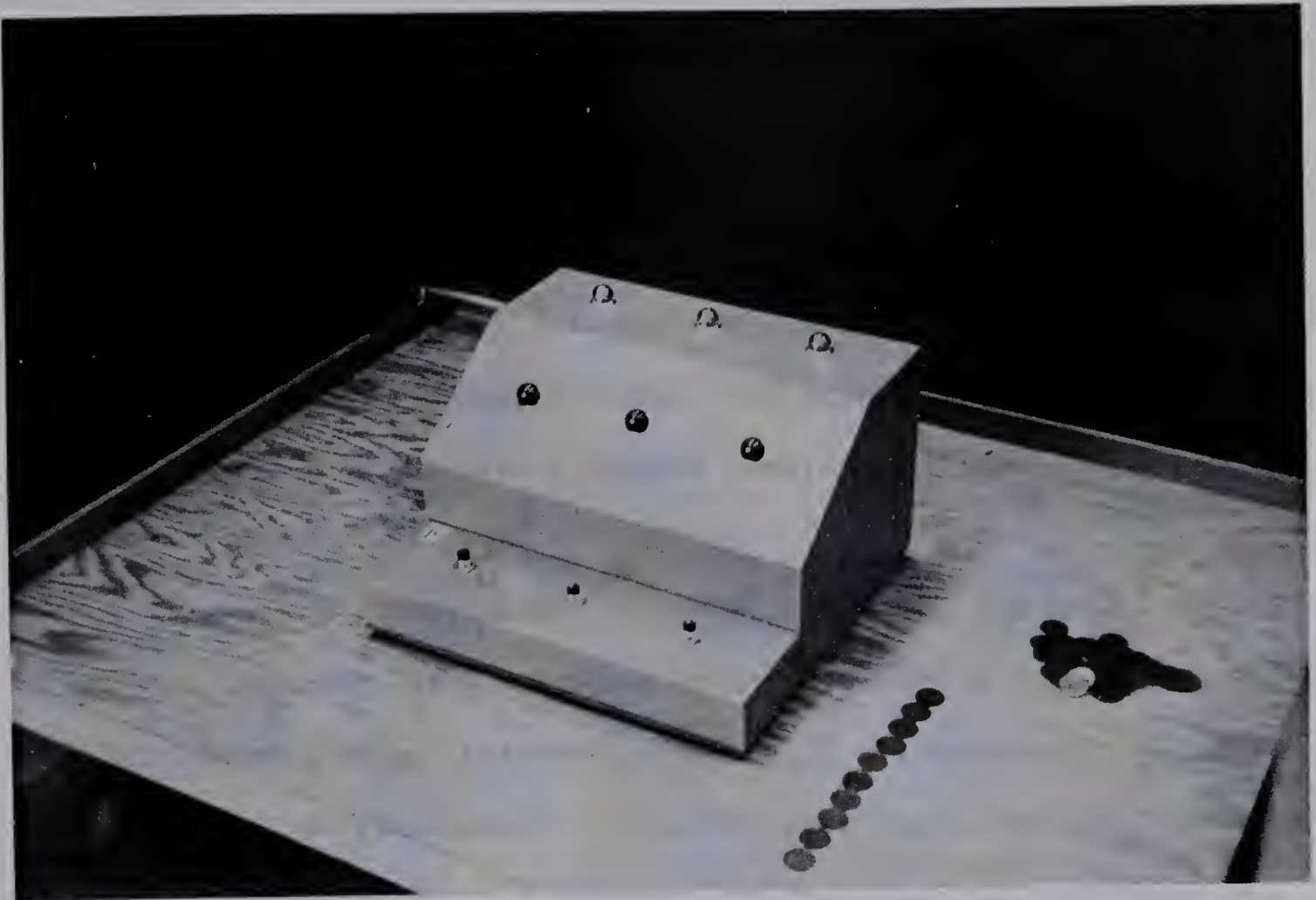


FIGURE 1

WORK STATION SHOWING THE WORK PANEL AND TOKENS

### Equipment

In order to standardize the experimental situation, it was desirable to design an apparatus that was completely automatic in operation and recording. Equally important was flexibility to allow rapid change of event probabilities. That is, the most frequent event and the least frequent event could be interchanged without necessitating a disruption in the procedure within a series of trials.



An apparatus was developed which served the following functions: (1) maintenance of a fixed timing cycle for all events; (2) illumination of pre-trial signal lights; (3) recording the first ternary response input with the exclusion of any further responses; (4) illumination of the appropriate event light for each subject as predetermined by the probability and/or pattern of the treatment; (5) graphic recording of all responses, programmed events, and scoring on a constant time base. Care was taken to make the equipment completely portable and easy to assemble and dismantle.

Every trial cycle for the four-to-six year age group lasted 8.5 seconds, beginning with a 3.5 second illumination of the signal lights. A 1.5 second interval followed, after which the appropriate correct event light was illuminated for two seconds. The inter-trial interval then followed, lasting 1.5 seconds. For the other two age groups the complete cycle lasted 6.5 seconds, beginning with 3.0 second signal lights. A 0.5 second interval followed, after which the event lights were illuminated for 2 seconds. The inter-trial interval then followed, lasting 1.0 second.

### Components

A Stoelting five-channel programmer was used to provide not only proper cycle timing, but also the programming of each treatment on a program film tape. An Esterline-Angus 20-pen recorder from the Department of Psychology at the University of Alberta provided a continuous record of the subject's responses as well as the programmed



correct event for each light at each of the three work panels. The three work panels were built to the investigator's specifications by Canadian Electronics, Ltd. The schematic and wiring diagram are in Appendix D, page 147. The apparatus as it was set up is illustrated in Figure 2, this page, and in Figure 1, page 45.



A



B

FIGURE 2

A - ESTERLINE ANGUS 20-PEN RECORDER

B - STOELTING FIVE-CHANNEL PROGRAMMER



The functional relationship of the components is shown in Figure 3, page 49. The schematics and technical description of this equipment are presented in Appendix D.

Since fifteen subjects were needed in each cell of the experimental design, it was desirable to run several subjects at a time. To do this, three identical work stations were used. Subjects were seated at three locations of a table. Each work position was on one side of the table and was at least four feet wide and separated from the other work stations by a partition, 24 inches high. The five-channel programmer and the 20-pen recorder were located inconspicuously at the far end of the table out of sight of the subject. At each work station there was the grey work panel with three signal lights on top, three event lights on the slanted portion of the panel, and three black buttons on the lower response panel (see Figure 1).

### Program Films

The transparent program film was prepared during the pilot study trials and adjusted for proper time intervals only when necessary to assure optimum programming of each treatment. Each film band had five tracks on it. The first track was used to control illumination of the signal lights; the next three tracks were used to program the three correct event lights (the left light by track 2, the middle light by track 3, and the right light by track 4). Track 5 was programmed to deflect the recorder pen every 20 trials to indicate the beginning and the end of each trial block of 20 trials. Variations in the length and



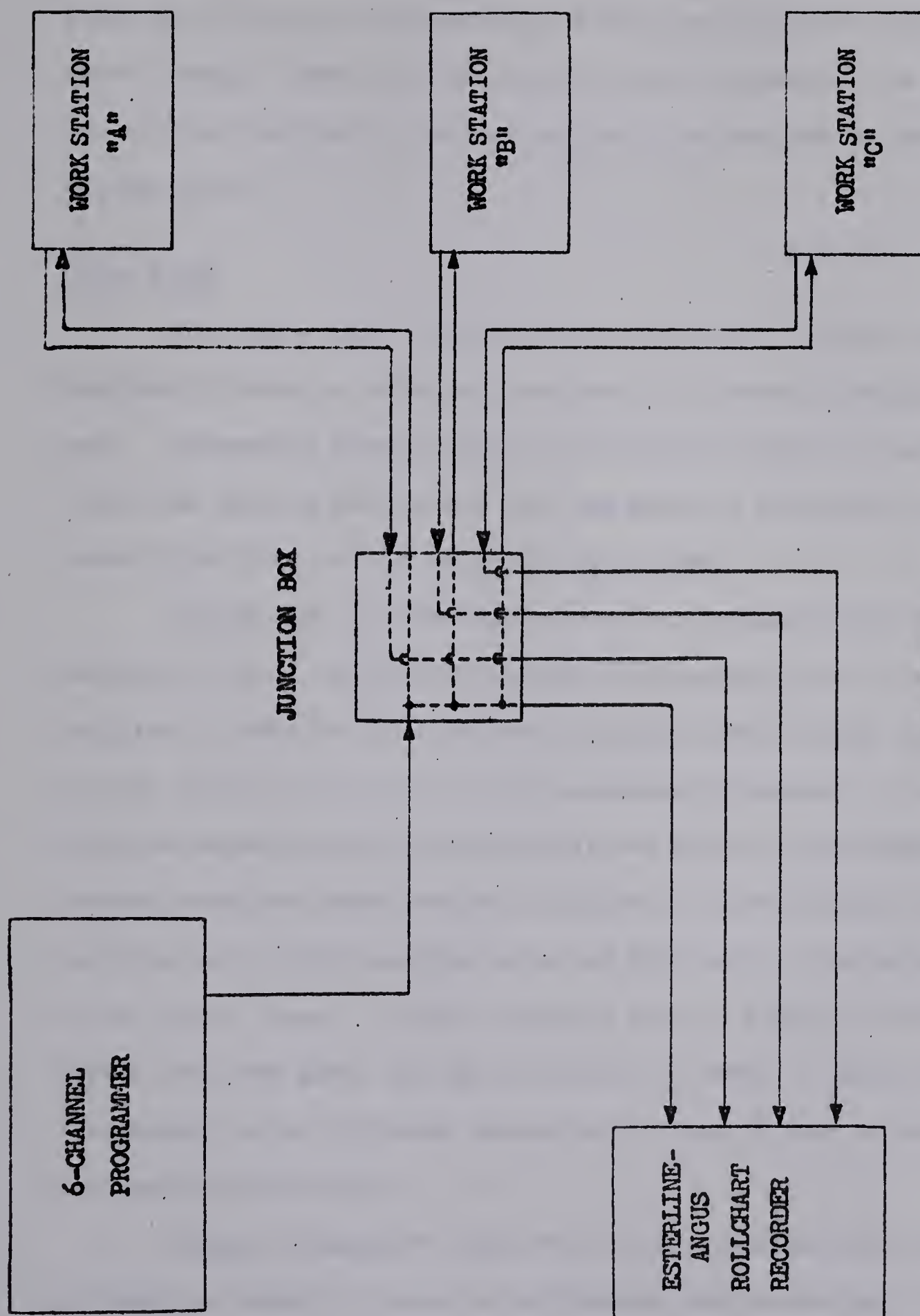


FIGURE 3

THE FUNCTIONAL RELATIONSHIPS OF THE COMPONENTS OF THE APPARATUS



the track on which opaque tape was placed on the program film made possible the timing and programming of events as required by the experimental design. There were two sets of three programmed film strips; one set for the four-to-six year age group and one set for the other two age groups.

### Pilot Study

The pilot study, using eighteen subjects of various ages, provided information which was important for a smooth-running experiment. Information from the pilot study was the basis for the 8.5 second trial time for the four-to-six year age group as compared to the 6.5 second trial time for the other two age groups.

In addition to knowledge of results, a token reward system was devised to insure optimum motivation. Each subject was to receive a red plastic token for each correct prediction, and a prize was given to each subject at the end of each experimental session. It was hoped that the subject would thus assign his own value to the tokens and the reward, since the reward was not specified. It soon became evident that the four-to-six year age group had difficulty in assigning a value to the token. Hence, a small incentive such as a piece of bubble gum, marble, etc. was given during the trials for every 10 tokens received. This seemed to be sufficient incentive for most of them to respond for the complete 200 trials.

Siegel's suggestion that 300 trials were needed for subjects to reach an asymptotic level of performance was checked and confirmed



for the two older age groups. However, the number of trials was reduced to 200 trials for the four-to-six year age group, since they became fatigued after that point.

The pilot study also provided a basis for phrasing of instructions, a trial of programmed film tapes, preparation of a post-experimental questionnaire, and mechanical organization of the whole experiment.

### Treatments

Treatment I - According to a predetermined random series, the left event came on 70 per cent of the trials while the middle and right events came on 20 and 10 per cent of the trials, respectively.

Treatment II - A simple pattern was designed whereby the events came on in the same proportion as in the random series, but the sequence followed a definite pattern, repeated every ten trials. After 140 trials for the four-to-six year age group and after 200 trials for the other two age groups the pattern was reversed (reversal shift). That is, the right event now became the most frequent event, the middle event remained the same, and the left event became the least frequent event.

Treatment III - In this condition there were four simultaneously programmed perfect patterns with the left event coming on 70 per cent of the trials, the middle event 30 per cent of the trials, and the right event 50 per cent of the trials. The sum of the event probabilities was greater than unity and therefore there were trials when one



TABLE III  
SEQUENCES OF TRIALS  
IN EACH OF THE THREE TREATMENTS

Treatment I (Random)				Treatment II (Simple Pattern)				Treatment III (Multi-Pattern)			
Trial	.7	.2	.1	Trial	.7	.2	.1	Trial	.7	.3	.5
1				1	*	-	-	1	*	-	*
2				2	-	*	-	2	-	*	-
3				3	-	-	*	3	*	-	*
4				4	*	-	-	4	*	-	-
5	(Randomized as per Table of Random Numbers)			5	-	*	-	5	*	-	*
6				6	*	-	-	6	-	*	-
7				7	*	-	-	7	*	-	*
8				8	*	-	-	8	*	-	-
9				9	*	-	-	9	*	-	*
10				10	*	-	-	10	-	*	-
11				11	*	-	-	11	*	-	*
12				12	-	*	-	12	*	-	-
13				13	-	-	*	13	*	-	*
14				14	*	-	-	14	-	*	-
15				15	-	*	-	15	*	-	*
16				16	*	-	-	16	*	-	-
17				17	*	-	-	17	*	-	*
18				18	*	-	-	18	-	*	-
19				19	*	-	-	19	*	-	*
20				20	*	-	-	20	-	*	-

\* Indicates the occurrence of the event



or two events occurred. The sequencing of events for each of these treatments is shown in Table III, page 52.

### Procedure

Since the apparatus required only a slight modification to interchange the program film tape for each treatment, the procedure employed in all three treatments for each age group was essentially the same.

The subjects were each seated at one of the three work stations (see Figure 4, page 54). There was an attendant at each station who assisted in the orientation by pointing out the various parts of the work panel as the instructions were read. The subject was instructed that one or more of the event lights would illuminate on each trial after a signal and that his task was to predict in advance which of the event lights would be illuminated. He was instructed to do his best in making these predictions.

Subjects were asked to predict which event would occur next, and for every correct prediction of any of the three events, a red plastic token was given in addition to the immediate visual reinforcement, confirming or disconfirming the prediction. Subjects were given ten tokens with which to begin the experimental task. The attendant at each work station kept before him a large number of red and green tokens. Whenever possible each attendant sat at right angles to the subject and cared for the receipt or loss of the tokens. The attendant either slid a token to the subject to form rows of ten tokens or took



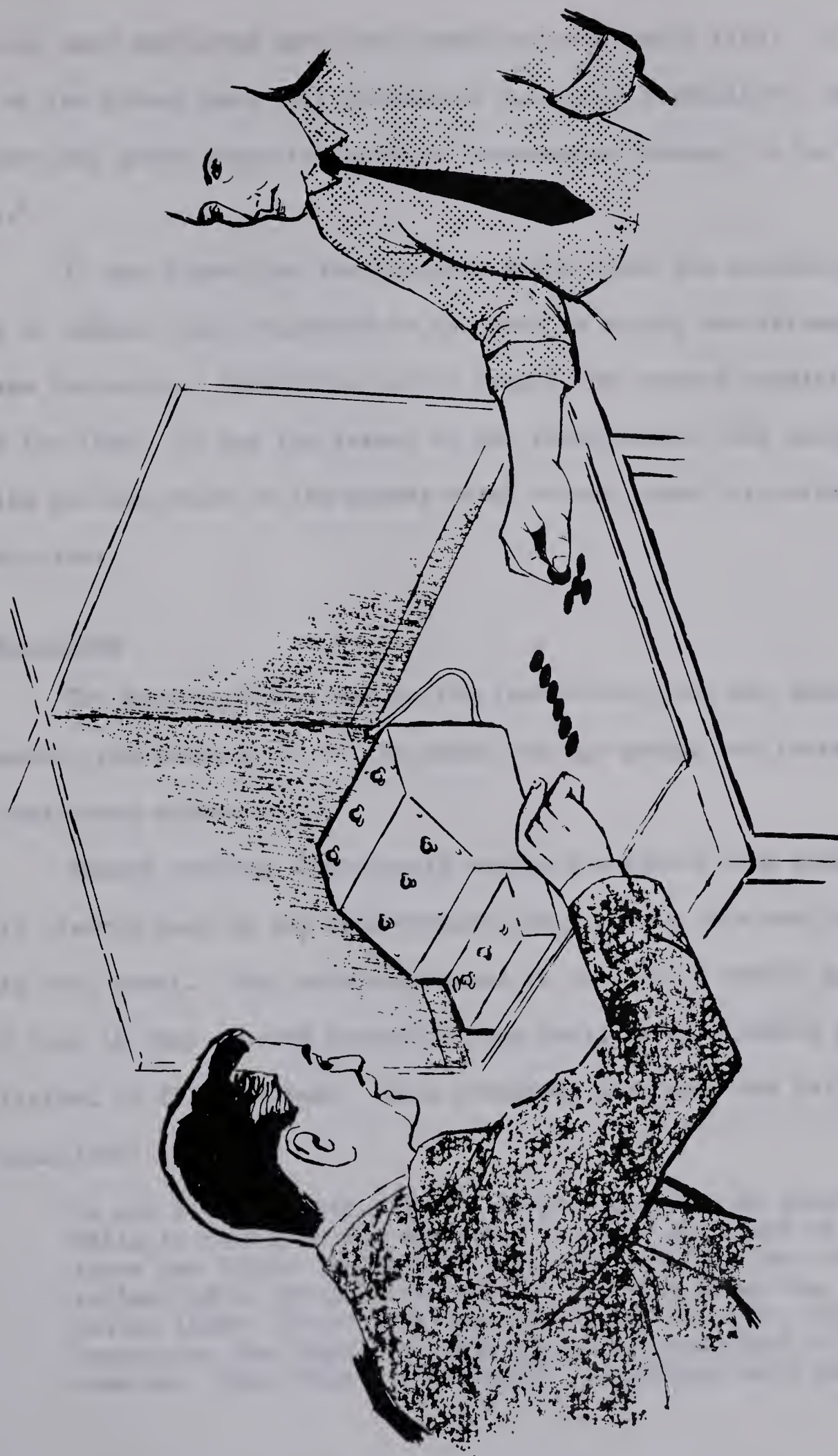
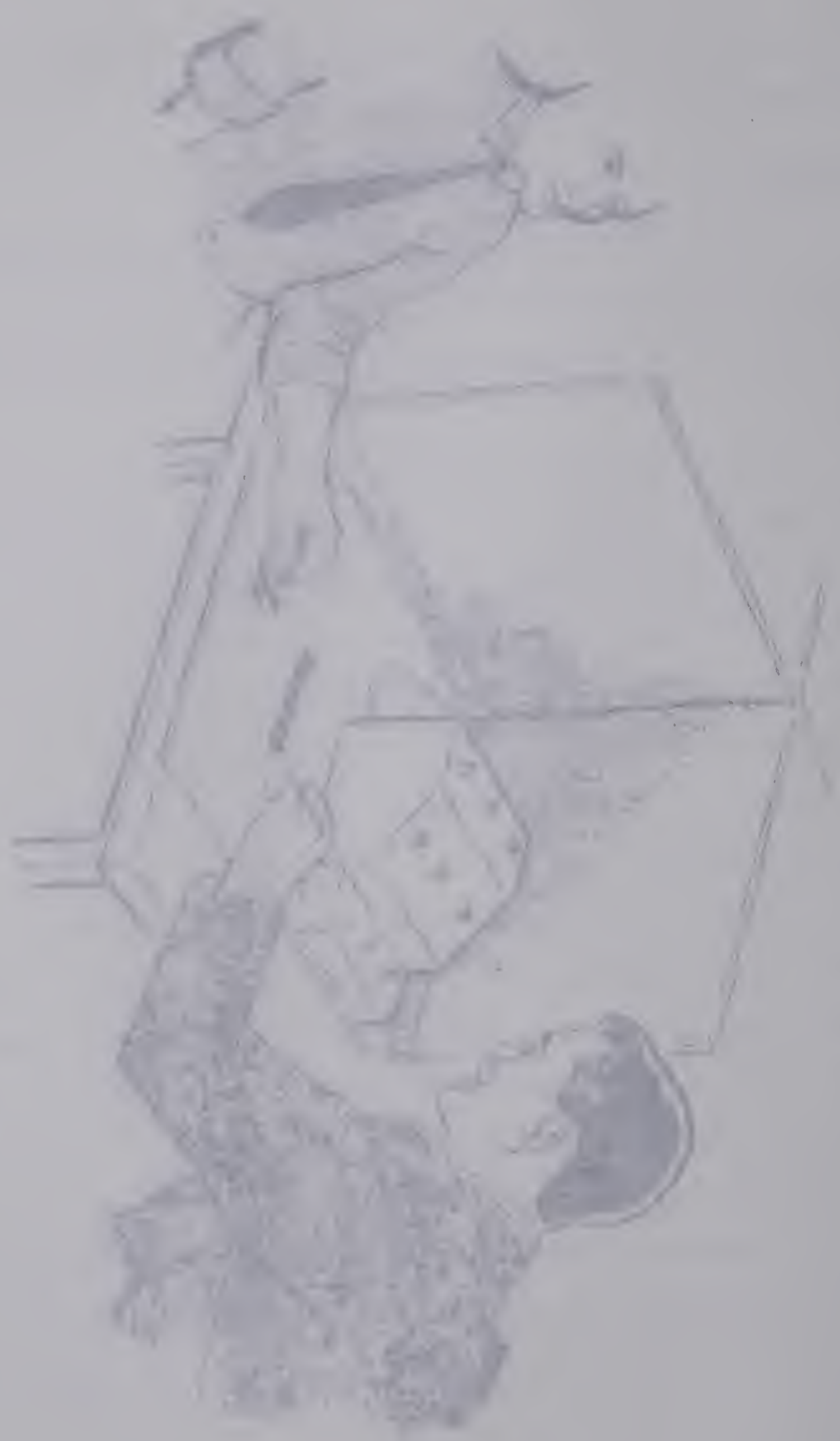


FIGURE 4  
SUBJECT AND ATTENDANT AT ONE OF THE THREE WORK STATIONS

Figure 1. Map of the study area showing the location of the study site (indicated by a star) and the surrounding features (indicated by the labels).



a token away depending upon his prediction after each trial. If all of the red tokens were lost because of incorrect predictions, the subject was given green tokens which represented tokens "to be paid back."

It was found that the youngest group could not tolerate the loss of tokens; they responded to the loss by crying and attempting to escape the scene. Therefore, only a reward for correct prediction was used for them. It was the intent of the experimenter that each subject assign his own value to the tokens which he was given for correct predictions.

### Instructions

The instructions given to the four-to-six year age group differed somewhat from those given to the other two age groups and therefore will be considered separately.

Before testing, four-to-six year old subjects were given a small plastic boat by the experimenter; they placed this boat beside their work panel. They were then asked if they liked bubble gum and told that if they guessed correctly they could receive bubble gum sufficient to fill the boat. Each attendant then gave the following instructions:

We are going to play a game. Do you like to play games? Well, in this game you are asked to guess which one of these red lights (point out) will come on after the top yellow lights (point out) come on. Shortly after the yellow lights (point out) come on, either the left, the center, or the right red light (point out each one) will come on. (For Treatment III only: "Sometimes more than



one light will come on." ). It is very important that you make your guess as soon as possible after the top yellow lights (point out) come on and while they are still on (read slowly and emphasize the italics). In any case, make your guess as soon as you can.

Do you see these three black buttons? (Point out) Well, if you think that the left red light will come on (point out), then press the left button (point out) immediately below it. If you think that the center red light (point out) will come on, press the center button (point out). If you think that the right red light (point out) will come on, press the right button (point out). If you think that the center red light (point out) will come on, which button would you press? (Check to see that the child is correct, if not repeat the previous paragraph again, making sure that each child understands what to do.)

Now every time you guess correctly which red light comes on, you will receive a red token (point out). When you have ten red tokens you will receive a bubble gum or a small prize (show a bubble gum). If you do not guess correctly, you do not get a red token. (For Treatment III only: If more than one light comes on, you are given a red token as long as the light for the button you pressed comes on.)

Now let's try to fill this boat with bubble gum. Whatever you get in this game you may keep and take home with you. (Pause) All right. Now, do your best to guess correctly every time while the yellow lights are on.

(Announce to all three subjects) Do all of you understand the game? Let's practice a few times to make sure you do know how. Ready? (Pause) Let's go.

Care was taken to make sure that all the children understood what was to be done.

Before testing the older two age groups, the following instructions were read:

Your task in this experiment is to try to predict correctly which of these three lights (point out) will



come on following the onset of the three signal lights, the top amber lights (point out). Three seconds after the amber lights come on, either the left, center, or right light will come on. (For Treatment III only -- On some occasions any two of the three lights will come on.) It is very important that you make your predictions as soon as possible after the amber signal lights first come on and while they are still on. In any case, you must make your prediction in less than three seconds.

On the table before you there is a work panel with three buttons on the lower level. If your prediction is that the left light will come on, press the left button with your left hand. If your prediction is that the middle light will come on, press the middle button with either hand. However, if your prediction is that the right light will come on, press the right button with your right hand.

Now every time you predict any of the red lights, you will receive a red token; every time you predict incorrectly you will lose one. (Point to tokens.) (For Treatment III only-- "If two lights come on, you will be credited with a correct prediction regardless of which one of the two lights you predicted and you will be given a red token.")

We will start you off with ten tokens. Now, if you do not predict carefully, you could end the session with green tokens which indicate your loss. However, if you predict carefully, you could end the session with a considerable number of tokens. The more tokens you receive, the better you will like your reward. Do your best to predict correctly which light will come on for every trial.

Do you have any questions as to what you are to do? (Pause)  
Let's run through some practice trials. This will allow you to note the timing of the trials.

### Post-Experiment Questionnaire

This questionnaire was presented in the form of a structured interview with the attendant recording the answers given by the two younger groups. The adult group completed the questionnaire on their own. The questionnaire was designed to provide information about the subject's perceptions of certain aspects of the experiment. It was



felt that some of this information might be useful in evaluating the outcome of the experiment and in designing further experiments. (For a sample of the questionnaire, see Exhibit 1, Appendix A, page 122.

At the conclusion of the session the subjects in the 4 to 6 year age group were given a paper bag in which to put their gifts. The 7 to 10 year age group were asked to choose a prize from a nearby table where a number of 25 to 30 cent items were displayed. The adult group were given a choice of a lead pencil or a ball point pen with a retail value of 45 cents.

Each session for the two older groups ended by reading the following cautionary instructions:

This experiment will be conducted for another two weeks. You are asked not to discuss details of what you did here today with anyone until after this time. If persons such as yourself discuss such matters, it will bias our data and invalidate the research at considerable cost of time, effort and money.

#### Recording of Raw Data

Two types of information were obtained from the 20-pen recorder roll charts: the total number of responses to each event in each block of twenty trials, and the number of correct responses to each event in each block of twenty trials. The number of responses to the most frequent event was extracted from this information. The total number of responses which each subject made to each of the three events was counted first and recorded on a special form provided for this purpose (Appendix A, Exhibit 2, page 123). Next, the number of correct responses



to each of the events was counted and recorded. From these data was generated the total number of responses to the most frequent event in each treatment and the total number of correct responses for each trial block in each treatment.

The data recorded on the special form were transferred to IBM computer cards in two sets of two cards each for each individual (Appendix A, Exhibit 3, page 124). Cards numbered 1 and 2 are "set I" and cards numbered 3 and 4 are "set II". Each card of each set was coded with 9 digits as follows: Treatment - 1, 2, or 3; sex - 0 (female) or 1 (male); age group - 1 (4 to 6 years), 2 (7 to 10 years), or 3 (adult); actual age of the individual (2 digits); individual identification number (3 digits); and card number - 1, 2, 3 or 4.

Set I had responses to events one and two ( $E_1$  and  $E_2$ ) for each trial block recorded on the first card and responses to event three ( $E_3$ ) for each trial block recorded on the second card. Set II had the total correct responses to  $E_1$  and  $E_2$  for each trial block recorded on card three and the total number of correct responses for  $E_3$  for each trial block recorded on card four. All numbers recorded were for the number of responses within a block of twenty trials.



## CHAPTER VI

### ANALYSIS OF RESULTS AND DISCUSSION

#### Methods of Analysis

The raw data of individual distributions of responses for each event for each trial block are presented in Tables E1 to E18 of Appendix E. Also, the distribution of total correct responses for each individual for all the events are presented in Tables E19 to E36 of Appendix E.

The data were analyzed by means of the IBM 7040 Computer of the University of Alberta. From the data the means of the responses per trial block for the most frequent events (MFE) and the means of the total correct responses (CR) for all events for the groups as well as for the treatments were plotted (see Appendix B). After visual comparisons of these response curves, analyses of variance were made using a procedure described by Winer (1962, pp. 337-344).

Two sets of analyses of variances were carried out. In one set the dependent variable was the most frequent event (MFE). In the other set the correct response (CR) was the dependent variable. The various analyses of variance performed are summarized and presented in Table VIII, Appendix C.

In order to get an appropriate error term ( $MS_{\text{error}}$ ) for the main effects in the analysis of variance, it was necessary to partition the total variance into two parts, namely, between subjects and within subjects. This partitioning provided the required  $MS_{\text{error}}$  term corrected



for the repeated measures effect. Because the hypotheses are not directly concerned with the repeated measures effect or its interactions, and because of the nature of the task, the F ratios and the p levels for the repeated measures effects are not reported. For example, one would expect to find trial effects significant, especially during the early pre-asymptotic trials. It would be unreasonable to assume that a subject begins a series of trials in a particular way and then persists in it for the remaining trials without gaining some information from the results of the earlier trials. In addition, because of the discontinuous nature of the curves, interactions of main effects are expected to be significant as well.

In terms of the task, the MFE curves (eg. Figure 5, p. 67) provided information for making inferences about the strategies that were used, whereas the CR curves (eg. Figure 6) not only provided the number of correct responses realized but also provided additional information necessary for distinguishing between matching strategy and patterned response strategy. To illustrate, the following series of trials (patterned) are given:

Trial	Events		
	L (p=.60)	M (p=.20)	R (p=.20)
1.	*	-	-
2.	*	-	-
3.	*	-	-
4.	-	*	-
5.	-	-	*

\* indicates the correct event



If a subject used pure strategy the MFE curve would indicate that he chose the  $L_{event}$  consistently (eg. LLLLL) but the CR curve would indicate that only 60% of his predictions were correct. If he used matching strategy (eg. RMLLL or LMLLR, etc.) or a patterned response strategy (eg. LLLMR) it would be impossible to distinguish with certainty from the MFE curve which strategy was used. In both instances the MFE curve would be the same and would indicate that MFE was predicted 60% of the time. However, the CR curve would provide the information necessary for distinguishing between the two strategies. If the subject used matching strategy his CR curve would indicate that he realized 60% of correct responses possible whereas, if he used patterned strategy, his CR curve would indicate that he realized 100% success in correct responses.

Three methods were employed in arriving at the asymptotic level of MFE choice behavior in Treatment I. Of these, the first two methods were unsatisfactory; that is, the polynomial fit using least squares method and the fitting of two regression lines by the least squares method without any restriction. The inadequacies of the first two methods will be discussed later under Treatment I. The third method, the one used, utilized the least squares method but stipulated that the second regression line must be parallel to the abscissa.

The recovery curves of MFE and CR in Treatment II were analyzed visually. The number of trials required by each group to make the recovery to the previous level of predicting the MFE after a reversal shift was the criterion for this analysis. This is presented graphically



in Figure 9, page 82.

A summary of subjects' responses to the post-experiment questionnaire is presented in Table XXI, Appendix A, pp. 125 - 128.

A more detailed analysis of results will now be presented.

### Results: Treatment I

Treatment I (random) was used exclusively to investigate the choice behavior of three age groups in terms of the strategies they used, the resulting correct responses, and the order in which each age group reached an asymptotic level of responding. Sex differences were also investigated. Although the results were not entirely conclusive, they did in most cases support the hypotheses.

Strategies: It was hypothesized that the 4-6 age group would behave as if they were using pure strategy, that the adults would use pure strategy, whereas the 7-10 age group would use some form of mixed strategy. The terms mixed strategy and matching strategy are synonymous.

In order to do an analysis of variance for all three age groups, it was necessary to consider only the first 10 blocks of trials, since the 4-6 year age group was limited to a total of 10 blocks of trials. The analysis of responses to the MFE indicated no significant statistical differences due to the main effect among the three age groups ( $F = 2.52$ ,  $df\ 2/84$ ,  $p < .08$ ). The analysis is presented in Table IV.

However, by breaking up the series of 10 trial blocks into two groups of 5 blocks each, the first 5 blocks were considered to be learning blocks where all the groups were approaching the asymptotic



TABLE IV

SUMMARY OF ANALYSIS OF VARIANCE OF MFE RESPONSES OF THREE AGE GROUPS  
BY MALES AND FEMALES OVER FIRST TEN TRIAL BLOCKS  
UNDER TREATMENT I (RANDOM)

Source of Variance	Sum of Squares	df	Mean Square	F	p
<u>Between Subjects</u>	<u>9,470.29</u>	<u>89</u>			
Age	531.38	2	265.69	2.52	0.08
Sex	44.00	1	44.00	0.42	0.52
Age x Sex	50.94	2	25.47	0.24	0.79
Subject W Group	8,843.97	84	105.29		
<u>Within Subject</u>	<u>10,862.70</u>	<u>810</u>			
Trials	4,608.96	9	512.10		
Age x Trials	697.35	18	38.74		
Sex x Trials	204.52	9	22.72		
Age x Sex x Trials	101.84	18	5.66		
Trials x Subj. w. G.	5,250.03	756	6.94		



TABLE V

SUMMARY OF ANALYSIS OF VARIANCE OF MFE RESPONSES OF THREE AGE GROUPS  
BY MALES AND FEMALES OVER SECOND FIVE TRIAL BLOCKS  
UNDER TREATMENT I (RANDOM)

Source of Variance	Sum of Squares	df	Mean Square	F	p
<u>Between Subjects</u>	<u>4,559.69</u>	<u>89</u>			
Age	333.50	2	166.75	3.45	0.04
Sex	158.42	1	158.42	3.28	0.07
Age x Sex	9.37	2	4.69	.10	0.91
Subject w. Group	4,058.40	84	48.31		
<u>Within Subject</u>	<u>1,430.80</u>	<u>360</u>			
Trials	88.86	4	22.21		
Age x Trials	118.04	8	14.75		
Sex x Trials	7.70	4	1.93		
Age x Sex x Trials	18.07	8	2.26		
Trials x Subj. w. G.	1,198.13	336	3.57		



level, whereas the remaining five blocks were considered to be indicative of the response strategy employed after reaching the approximate asymptotic level. The decision to divide the trial block into two groups of five resulted from a consideration of two sources of information. The first consideration was the visual inspection of MFE response curves which indicated a breaking point between trial blocks five and six (see Figure 5, page 67) while the second came from an analysis of estimated trial blocks of asymptotic MFE response levels found in Table VII, page 74. This division of trial blocks was made for this analysis only.

With the division made, the analysis of responses of the last 5 blocks (6 through 10) showed a significant statistical difference for MFE ( $F = 3.45$ ,  $df\ 2/84$ ,  $p < .036$ ). A complete summary of the analysis of MFE responses of trial blocks 6 through 10 is found in Table V, on the previous page. Visual inspection of trial blocks 7, 8, 9 and 10 (see Figure 5) also indicates a tendency for the 4-6 year age group and the adult group to behave in a very similar manner in their choice behavior, both differing markedly from the 7-10 year age group.

This inspection was confirmed by a means test which indicated no statistical difference between the 4-6 year age group and the adults (means 't' test  $p \leq .25$ ) but a significant difference between the 7 to 10 year age group and the two remaining groups ( $p < .01$  and  $.10 > p > .05$ ). The less significant difference for the youngest group undoubtedly would have been highly significant had they arrived earlier at their asymptotic



Means

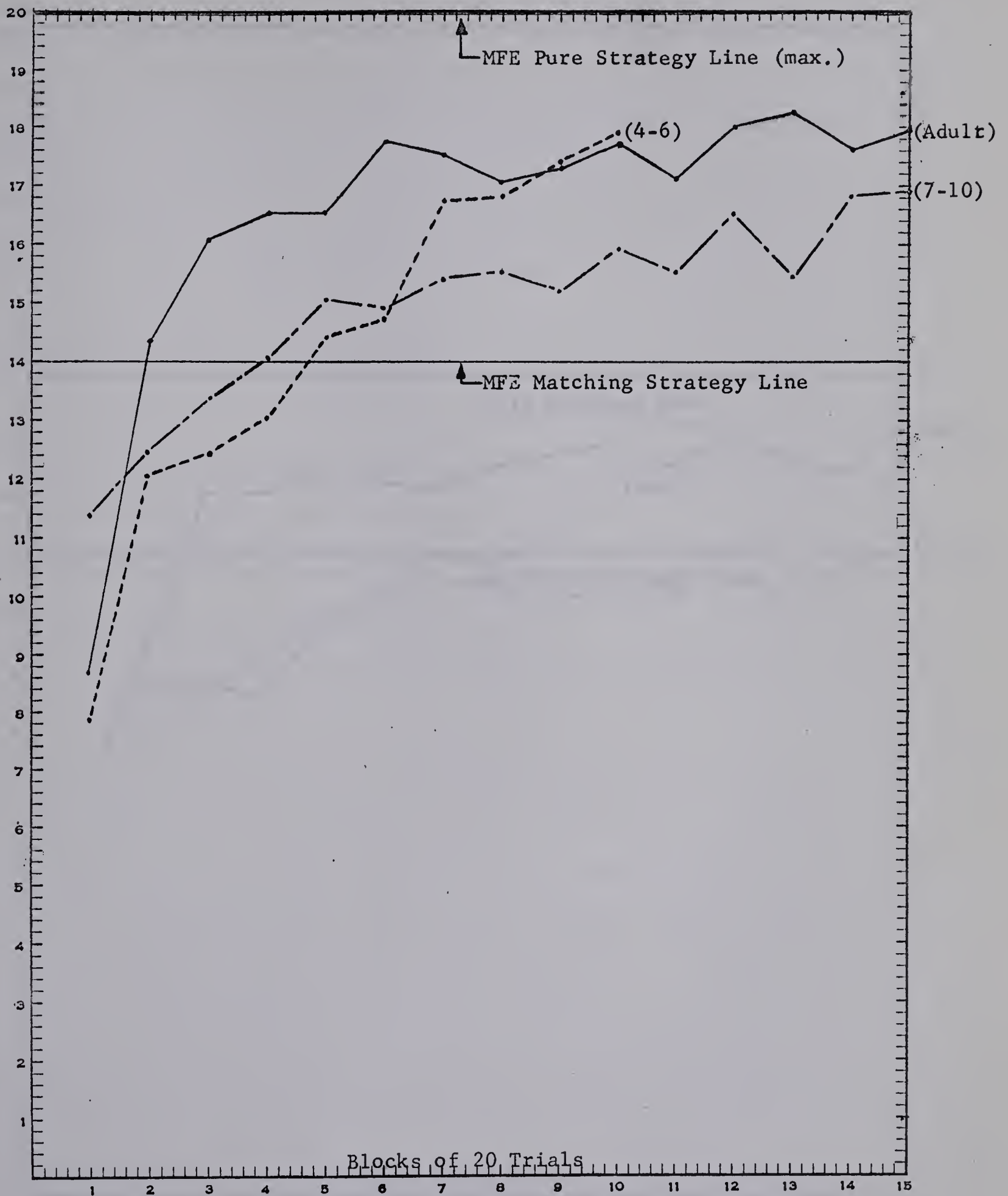


FIGURE 5

MFE RESPONSE CURVES FOR THE THREE AGE GROUPS (M&amp;F) UNDER TREATMENT I



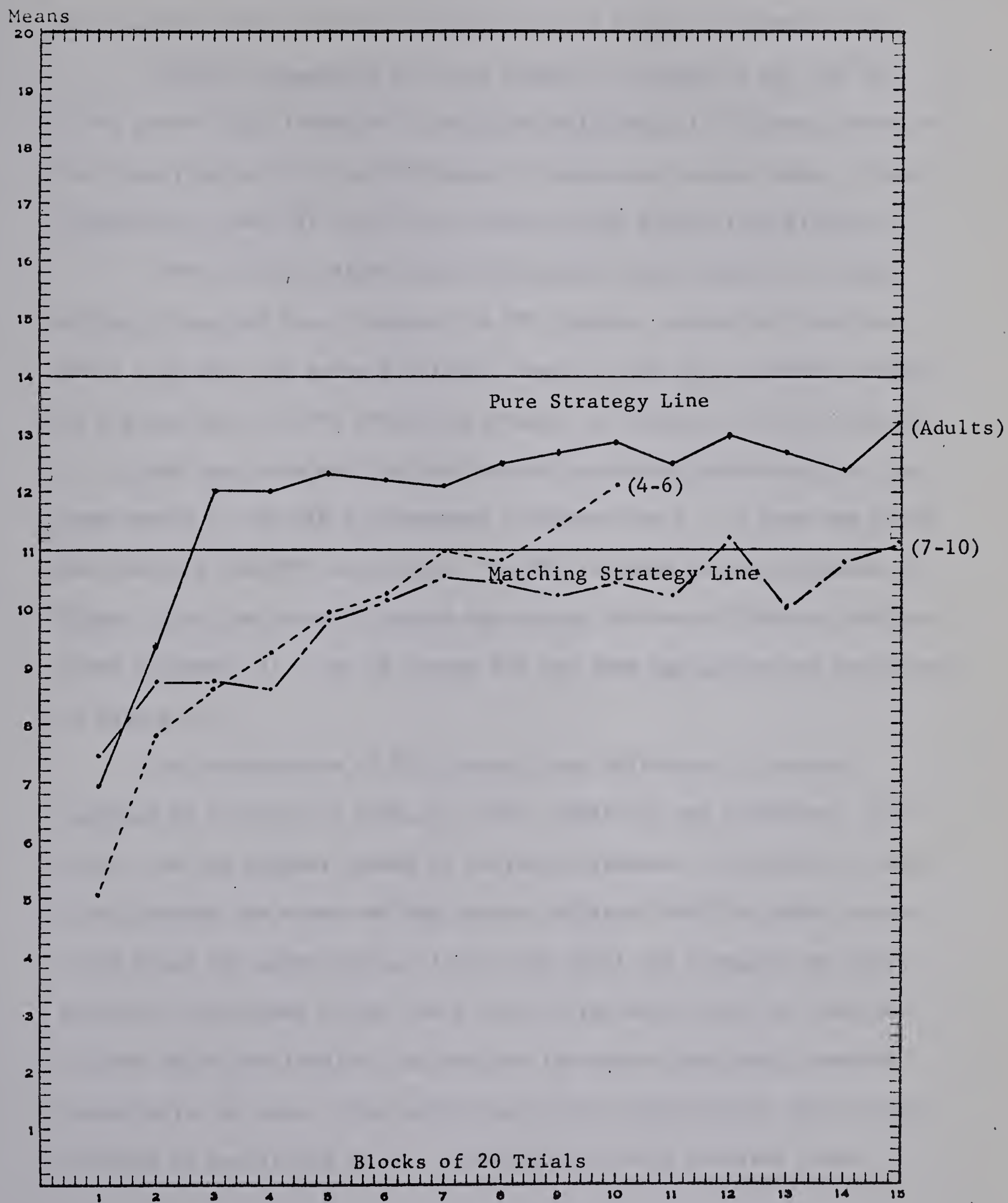


FIGURE 6

CR CURVES FOR THE THREE AGE GROUPS (M&amp;F) UNDER TREATMENT I



MFE response level. This in no way detracts from the hypotheses 1a.

Further inspection of trial blocks 11 through 15 for the two older groups also indicates a continued difference in response behavior. The stabilization of this difference is even more evident when a visual inspection is made of the CR for these two age groups (see Figure 6).

There were no significant differences due to sex or an interaction of age and sex. However the MFE response curves did show that the 7 - 10 year age group persisted longer in the use of mixed strategy as a group than did the other two groups. At the end of 200 trials the 4 - 6 year age group and the adults were responding essentially in the same manner to the MFE in Treatment I whereas the 7 - 10 year age group was choosing the MFE less often. The MFE response curves are shown in Figure 5 for the three different age groups (males and females combined under Treatment I). The CR curves for the same age groups are presented in Figure 6.

In the analysis of CR a significant difference in correct response ( $F = 10.77$ ,  $df\ 2/84$ ,  $p < .001$ , Table VI) was indicated. The adults had the highest number of correct responses in the next to last block whereas the other two age groups realized about the same success until about the sixth block. After that point the youngest age group gradually approached closer and closer to the adult level of realized success while the level of success for the middle age group remained essentially the same. This middle age group stabilized in their mixed strategy by persisting in it. Consequently, their realized payoff in



TABLE VI

SUMMARY OF ANALYSIS OF VARIANCE OF CR OF THREE AGE GROUPS  
BY MALES AND FEMALES OVER FIRST TEN TRIAL BLOCKS  
UNDER TREATMENT I (RANDOM)

Source of Variance	Sum of Squares	df	Mean Square	F	p
<u>Between Subjects</u>	<u>4,282.78</u>	<u>89</u>			
Age	843.68	2	421.84	10.77	0.001
Sex	28.09	1	28.09	0.72	0.40
Age x Sex	120.41	2	60.20	1.54	0.22
Subjects W Group	3,290.60	84	39.17		
<u>Within Subjects</u>	<u>5,853.10</u>	<u>810</u>			
Trials	2,047.11	9	227.46		
Age x Trials	228.25	18	16.01		
Sex x Trials	69.79	9	7.75		
Age x Sex x Trials	86.42	18	4.80		
Trials x Subj. w. G.	3,361.54	756	4.45		



correct responses was lower than that of the two other groups. There were no significant differences as to sex or to an interaction of age and sex.

These results, therefore, support the hypothesis made. The analysis of the MFE curves more than points in the direction of the first hypothesis, while the analysis of CR curves definitely supports the hypothesis.

Asymptotic level: The second hypothesis under Treatment I deals with the order in which the various age groups reach the asymptotic level of behavior. In part, the hypothesis also serves to check the findings reported by Weir (1964) where he states that there is a curvilinear (U-shaped) relationship between age and the terminal level of correct responses, in which the younger subjects show a more rapid rise to terminal level of response than do the older subjects.

The hypothesis to be tested states that the asymptotic level should be reached first by the 4 - 6 year age group, then by the adults, and finally by the 7 - 10 year age group. Although the results did not support the hypothesis of this study, they did support Weir's findings of a U-shaped relationship between age and the terminal level of response and between age and the rate of rise to the terminal level.

Three methods were used in determining the asymptotic level of predicting the MFE by each group under Treatment I. Within each age group calculations were carried out for both sexes together, as well as for each sex separately.



The first method used was the polynomial fit using least squares method. This proved totally unsatisfactory. It fitted a curve but did not provide a reasonable point needed for this analysis to indicate where the asymptotic level of behavior had been reached. The second method used was the fitting of two regression lines by using the least squares method without any restriction on slopes of either. It was unsatisfactory as well, since the slope of the second regression line was not always zero. At best it indicated the point at which a change in rate took place. Therefore, the third method was employed, that of using the least squares solution to estimate two regression lines. This method arbitrarily stipulated that the regression line for the last  $N-L$  points under study was to have a zero slope, while the regression line for the beginning  $L$  points was not so restricted. Beginning with the  $L$  initial points and  $N-L$  remaining points, the intersection of the regression lines were calculated for each of  $L+j$  and  $N-L-j$  ( $j=0,1,2,---$ ) the intersection provided the estimate of the trial block in which the subjects were considered to have reached a stable state of choice behavior.

The method that was finally used to fit the two regression lines may be summarized as follows:

1. The intersection of two regression lines was used to estimate the point for the beginning of the asymptotic level of response.
2. Iterative procedures were used for fitting one curve ( $y=a+bx$ ) on the basis of the first 2 to  $N-2$  points while at the same time fitting



a second curve ( $y = a$ ) for  $N-2$  to 1 point.

The residual sums of squares per point was used as criterion to select the pairs of lines. The intersection of that pair of lines with minimum residuals were used to estimate the beginning of the asymptote.

Mathematically, the point at which the asymptotic behavior began was taken as the intersection of those two regression lines, one of the form  $y = a + bx$ , the other of the form  $y = a$ , for which, for any

group

$$SS = \sum_{i=1}^L \frac{(X_i - \hat{X}_i)^2}{L} + \sum_{j=L+1}^N \frac{(X_j - \hat{X}_j)^2}{N - L} \quad \text{was a}$$

minimum.

Where,  $\hat{X}_i = a + bx_i$

$\hat{X}_j = \bar{X}_j$

$i = 1, 2, \dots, N-3$

$j = L + 1, + 2, \dots, N$

$L$  initially equals 2

The results of this latter method are summarized in Table VII, page 74. It can readily be seen that the adults and the 7 - 10 year olds reached their respective asymptotic levels at about the same time. The youngest group took the longest. Since there was no definite leveling off of the response curve after 200 trials for this youngest group, it is impossible to conclude just when they would have reached a stable state by our definition. Therefore, it was necessary to make



TABLE VII

ESTIMATES OF TRIAL BLOCK OF ASYMPTOTIC MFE  
RESPONSE LEVEL FOR TREATMENT I (RANDOM)

Age Group	Sex	N	Regression Line (A)**			Regression Line (B)***			Point of Inter-section*	Approximate Trial	Trial Block
			Pts	Ayx	Byx	Pts	Ayx	Byx			
4-6 yrs											
I	M-F	30	1-9	8.651	1.049	10-10	17.900	0.000	8.820	176	180-200
I	M	15	1-9	8.502	1.162	10-10	18.330	0.000	8.458	165	160-180
I	F	15	1-9	8.797	0.936	10-10	17.470	0.000	9.269	183	180-200
7-10 yrs											
II	M-F	30	1-5	10.512	0.900	6-15	15.803	0.000	5.879	117	100-120
II	M	15	1-6	9.688	0.933	7-15	16.221	0.000	6.999	140	140-160
II	F	15	1-5	11.631	0.741	6-16	15.586	0.000	5.248	100	100-120
Adult											
III	M-F	30	1-7	10.421	1.233	8-15	17.604	0.000	5.872	118	100-120
III	M	15	1-7	9.674	1.448	8-15	18.241	0.000	5.917	118	100-120
III	F	15	1-6	10.363	1.300	7-15	16.933	0.000	5.055	101	100-120

\* Point of intersection unit is a trial block

\*\* Regression line of the form  $y = a + bx$ \*\*\* Regression line of the form  $y = a$



the assumption that they did reach an asymptotic level or would have reached one if they had been allowed to continue for a greater number of trials. The best estimate of the asymptotic level was taken as the last trial block.

A graphic presentation of the findings given in Table IV may be found in Figures 15 to 23, Appendix B, pp. 130 - 138). These figures depict the MFE response curves and the two fitted regression lines for each group and also for each sex within the group.

#### Results: Treatment II

Of the three treatments used, the results of Treatment II (simple pattern) are most interesting.

The conditions under Treatment II were designed to differentiate between the three groups on the basis of cognitive development. The rationale underlying Treatment II (and later on in Treatment III) is that the Piagetian stages of cognitive development not only will dictate the abilities that are available to each age group but also will shed further light on why each group may have employed a particular strategy. To accomplish this the probability of each event remained the same as that in Treatment I. For the most part the first two treatments appeared to be identical. However, built into Treatment II was a pattern which according to Piaget's theory should be a formal operations task which determined the sequence of the events.

Another condition of Treatment II was the reversal shift which consisted on an interchange of the MFE with the least frequent event



after a specified number of trials. It was assumed that 140 trials for the 4 - 6 year age group (and 200 trials for the other two groups) was a sufficient number of trials for the youngest group to be centrated on the MFE. However, because the 4 - 6 year age group should have centrated on and may be becoming conditioned to the MFE they would take the greatest number of trials to recover their former level of response to the MFE after the reversal shift.

Simple Pattern: It was hypothesized that the 4 - 6 year age group would respond most frequently to the MFE in a manner which would suggest that they used pure strategy. The adult group would be the only group to detect a repeating pattern of events, to learn it, and to persist in it by using a patterned response strategy. Results were conclusive in supporting all parts of the hypothesis.

To test the hypotheses 2a and 2c it was necessary to restrict the analysis to the first seven blocks. The restriction was made necessary because of the reversal shift of the patterned events at the end of the 7th trial block for the 4 - 6 year age group. The restriction did not deter the testing of the hypotheses since there were a sufficient number of trials to indicate the strategy that was used by each group.

The analysis of the responses to the MFE in the first 7 trial blocks indicated no significant differences ( $F = 1.35$ ,  $df = 2/84$ ,  $p > .27$ , Table VIII) within the three age groups. These differences are shown in Figure 7 where a visual comparison can be made of the MFE curves for the three age groups. There were no significant ( $F = 0.51$ ,  $df = 1/84$ ,  $p > .48$ , Table VIII) sex differences evident for any of the three groups.



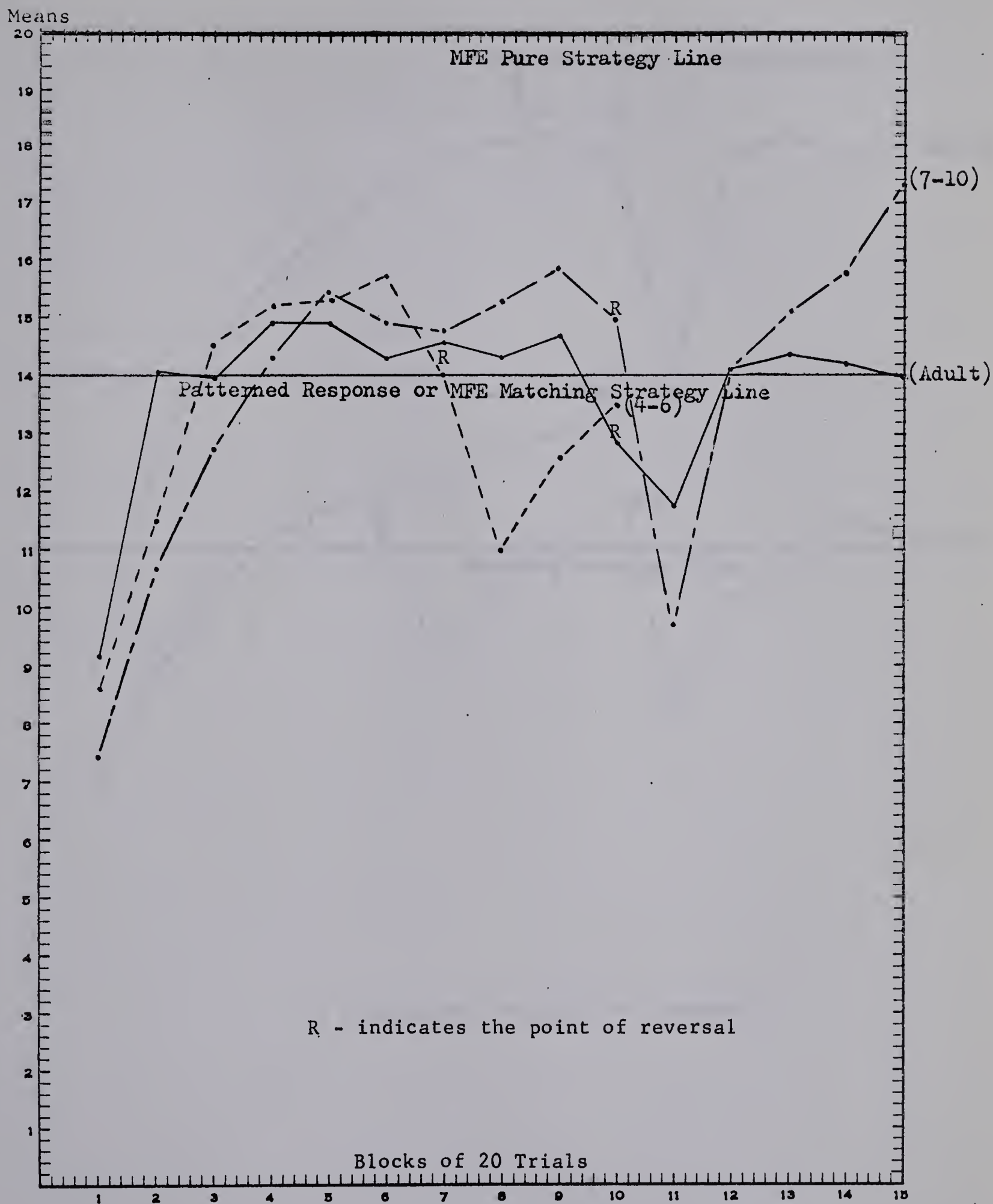


FIGURE 7

MFE RESPONSE CURVES FOR THE THREE AGE GROUPS (M&F) UNDER TREATMENT II



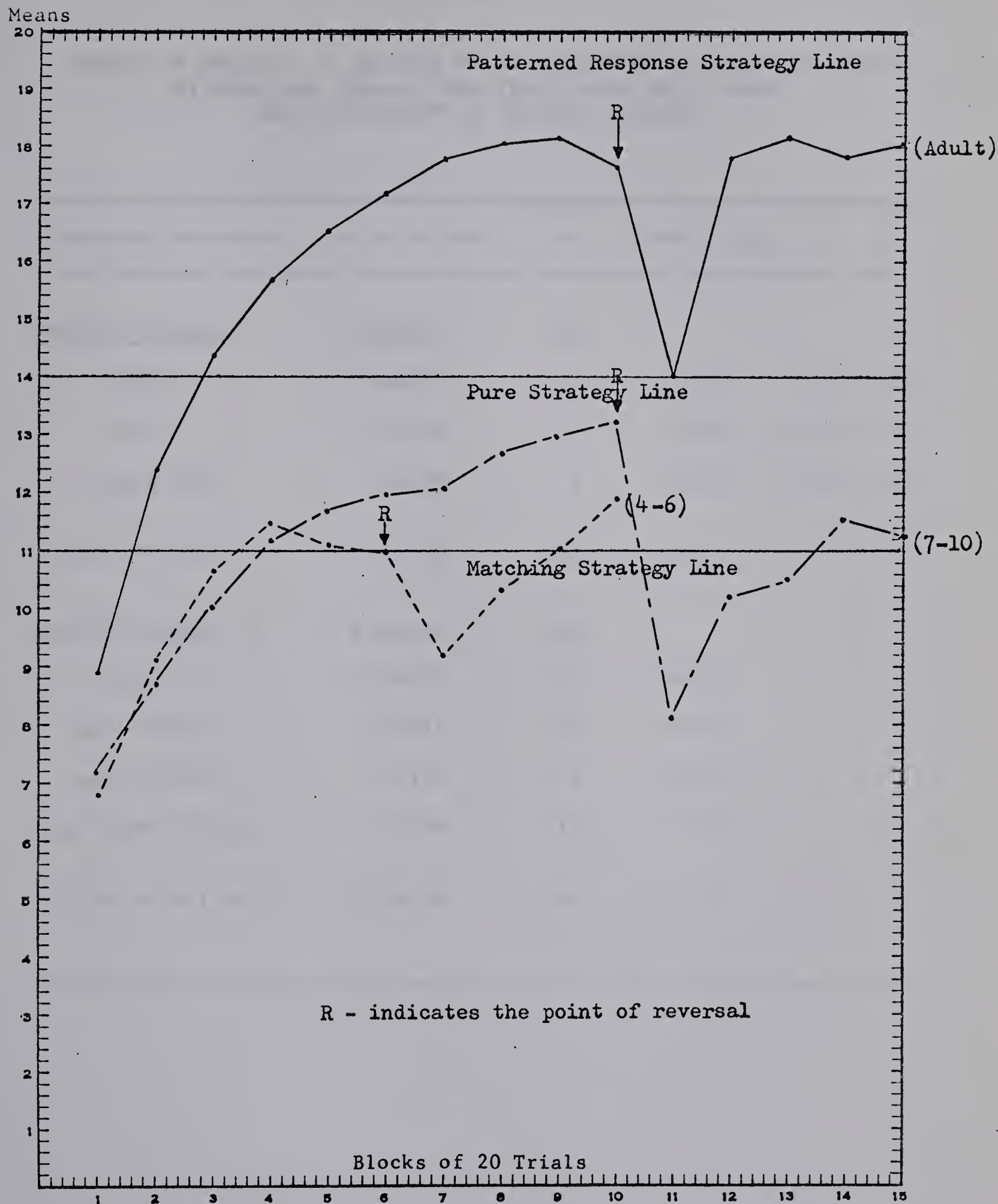


FIGURE 8

CR CURVES FOR THE THREE AGE GROUPS (M&amp;F) UNDER TREATMENT II



TABLE VIII

SUMMARY OF ANALYSIS OF VARIANCE OF MFE RESPONSES OF THREE AGE GROUPS  
BY MALES AND FEMALES OVER FIRST SEVEN TRIAL BLOCKS  
UNDER TREATMENT II (SIMPLE PATTERN)

Source of Variance	Sum of Squares	df	Mean Square	F	p
<u>Between Subjects</u>	<u>4,667.95</u>	<u>89</u>			
Age	142.50	2	71.25	1.35	0.27
Sex	27.24	1	27.24	0.51	0.48
Age x Sex	50.29	2	25.14	0.47	0.62
Subject W Group	4,447.92	84	52.95		
<u>Within Subjects</u>	<u>8,085.14</u>	<u>540</u>			
Trials	3,398.35	6	566.39		
Age x Trials	236.61	12	19.72		
Sex x Trials	79.28	6	13.21		
Age x Sex x Trials	51.36	12	4.28		
Trials x Subj. w. G.	4,319.54	504	8.57		



TABLE IX

SUMMARY OF ANALYSIS OF VARIANCE OF CR OF THREE AGE GROUPS  
BY MALES AND FEMALES OVER FIRST SEVEN TRIAL BLOCKS  
UNDER TREATMENT II (SIMPLE PATTERN)

Source of Variance	Sum of Squares	df	Mean Square	F	p
<u>Between Subjects</u>	<u>7,471.67</u>	<u>89</u>			
Age	2,929.68	2	1,464.84	27.48	0.001
Sex	0.46	1	0.46	0.01	0.93
Age x Sex	63.55	2	31.77	0.60	0.55
Subjects W Group	4,477.98	84	53.31		
<u>Within Subjects</u>	<u>5,978.00</u>	<u>540</u>			
Trials	2,427.37	6	404.56		
Age x Trials	466.19	12	38.85		
Sex x Trials	40.20	6	6.70		
Age x Sex x Trials	33.43	12	2.79		
Trials x Subj. w. G.	3,010.82	504	5.97		



However, an analysis of the CR (block 1 through 7) indicates a significant difference ( $F = 27.48$ ,  $df = 2/84$ ,  $p < .001$ , Table IX) in the main effect of Treatment II. The three CR curves are presented in Figure 8. It appeared that from the very first trial block the adults were able to detect the pattern, learn it, and respond to it. This patterned response strategy gave many subjects a perfect response behavior.

The youngest and middle age groups behaved much the same in the first 5 trial blocks but then differences became evident. The middle age group displayed a tendency toward mixed strategy up to the 10th trial block. The reversal shift immediately after the 200th trial caused them to abandon the previous mixed strategy at the point of recovery for what appears to be a shift towards a "pure" strategy. Both of the younger groups had about the same number of correct responses in their predictions for the first six trial blocks. From that point they differed.

Reversal shift: The second hypothesis under Treatment II states that upon reversal of the MFE the youngest group will take longest recovery to previous level of response to the MFE, while the adults will be first and the middle group second. This hypothesis was fully supported by the data.

During the trial block prior to the reversal the 7 - 10 year age group had the highest response frequency to the MFE, next were the 4 - 6 year age group, and last were the adults. After the reversal the greatest drop in the response curve was seen in the 7 - 10 year age group, then in



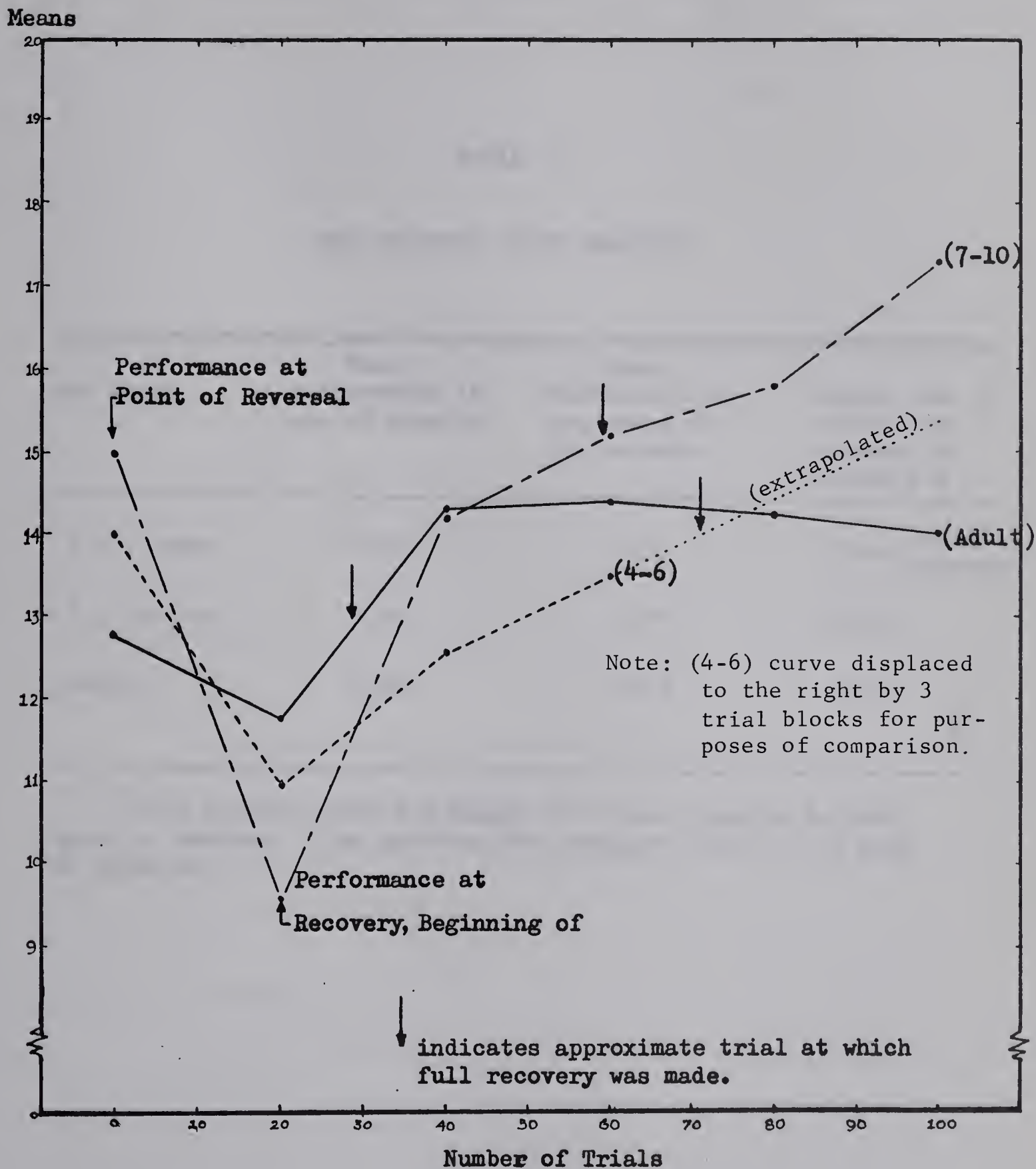


FIGURE 9

MFE RECOVERY CURVES FOR ALL THE THREE GROUPS (M&F) UNDER TREATMENT II  
FROM POINT OF REVERSAL



TABLE X

## MFE RECOVERY CURVE ANALYSIS

Age Group	Mean Performance at pt. of reversal	Mean Performance at beginning pt. of recovery	Approx. no. of trials from reversal to recovery *
4 - 6 years	14.03	10.97	75th (inter- polated)
7 - 10 years	15.00	9.70	58th
Adult	12.00	11.83	28th

\* The criterion was the number of trials required by each group to recover to the previous MFE response level at the time of reversal.



the 4 - 6 year age group, with the least drop in the adult group (see Figure 9, page 82). After the drop it took the adult group approximately 25 to 30 trials for the curve to recover, about 55 to 60 trials for the 7 - 10 year age group, and at the end of their remaining 60 trials the 4 - 6 year age group had not yet recovered (Figure 9). If the recovery curve was projected at the same rate as prior to the last trial block, it is inferred that the 4 - 6 year age group would have taken 75 - 80 trials to recover. The MFE recovery curve analysis is summarized in Table X, page 83.

From the calculations of the recovery curve analysis it is possible to see that the youngest group took longest to recover. They differed from the other two groups in that they had centrated and were unable to utilize such abilities as would permit a rapid adaptation to the MFE.

Sex Differences: As hypothesized in the third instance under Treatment II there were no significant ( $F = 0.51$ ,  $df = 1/84$ ,  $p > .48$ , Table VIII) differences due to the main effect of the treatment between the sexes of all three groups.

#### Results: Treatment III

The investigation under Treatment III (multi-pattern) was somewhat exploratory in nature. It was designed to investigate the behavior and the strategies each age group would display in a highly complex situation. The conditions of the treatment provided for a number of equally possible but competing patterns, any one of which could yield a



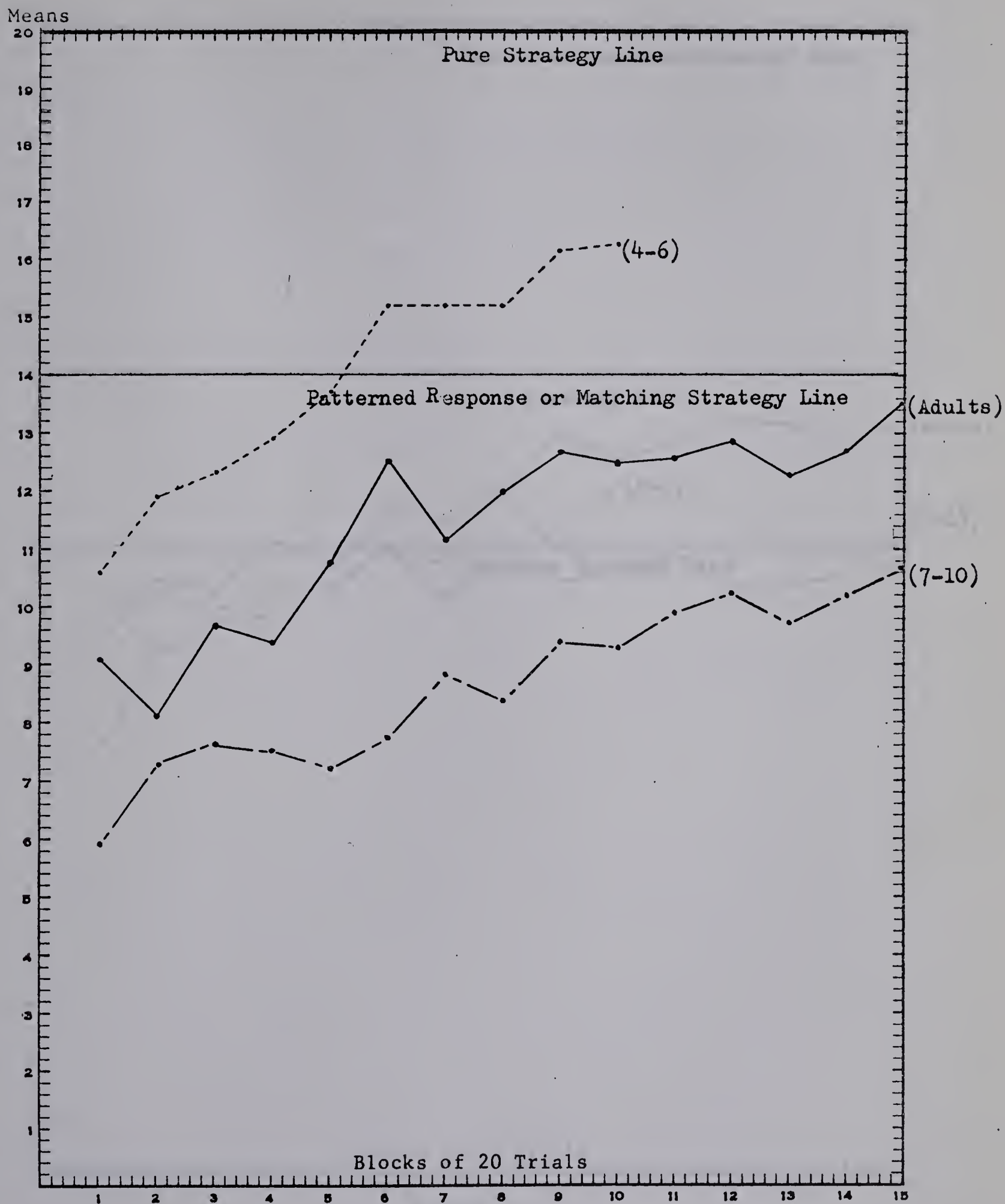


FIGURE 10

MFE RESPONSE CURVES FOR THE THREE AGE GROUPS (M&amp;F) UNDER TREATMENT III



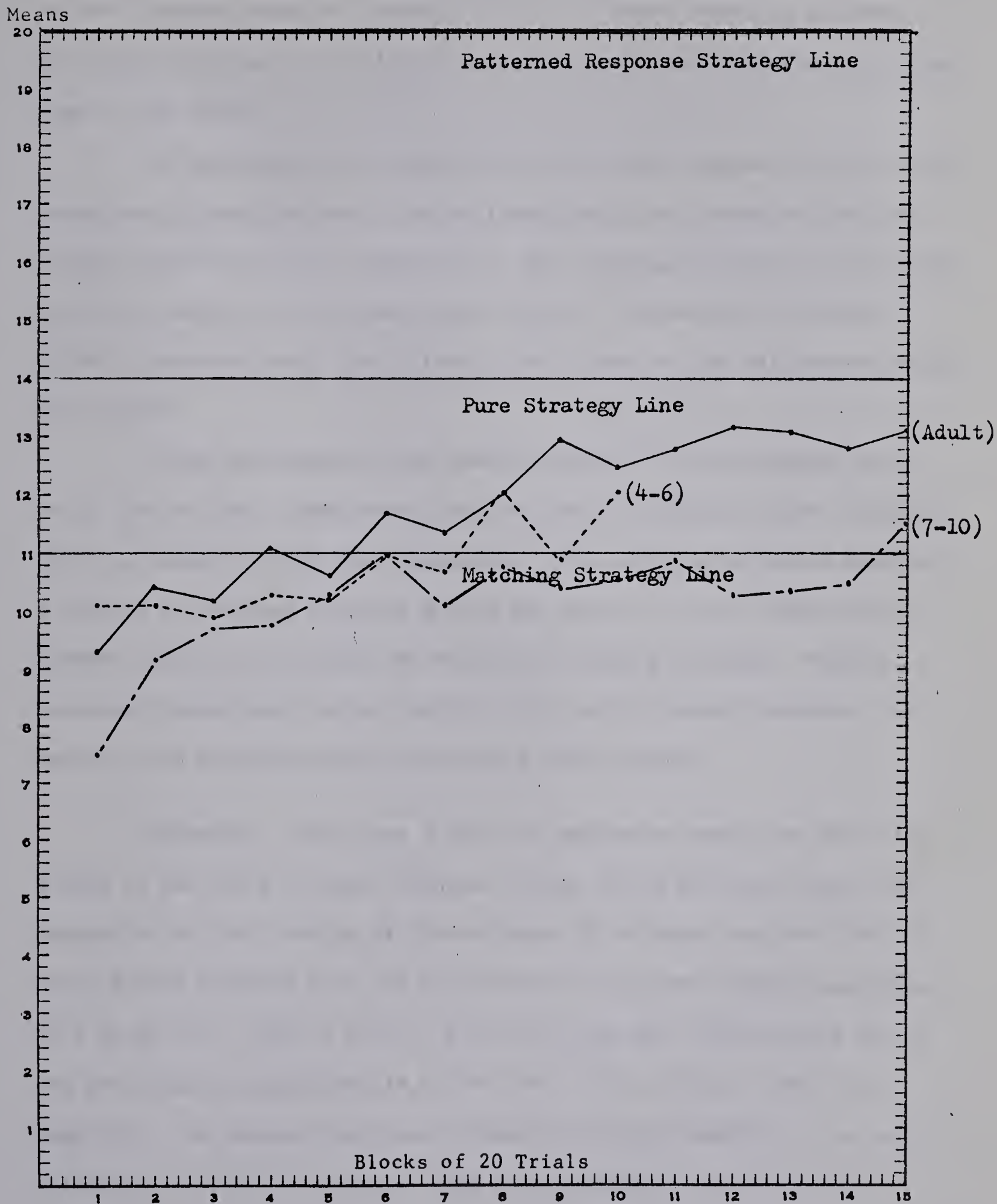


FIGURE 11

CR CURVES FOR ALL THREE GROUPS UNDER TREATMENT III (M&amp;F)



perfect response behavior (because  $\sum_i \pi_i > 1$ ). These competing patterns add to the complexity by offering more than one correct alternative during some of the trials.

The questions to be answered by this highly complex situation with competing alternatives are: How will each age group behave as they try to cope with this kind of complexity? What strategy, as dictated by their cognitive abilities, will each group display? How widely will their behavior separate them? And, finally, will there be sex differences within the groups?

It was hypothesized that under Treatment III the youngest group would resolve their problem--solving the task by applying "pure" strategy, that is, choose the MFE most frequently. The middle group would generate a variety of response patterns during the series of trials which would prevent them from realizing the success of a mixed strategy. However, the adults would apply pure strategy after trying a mixed strategy. All parts of the hypothesis were confirmed by the results.

**Strategies:** There was a definite separation among the three age groups on the basis of their response curves to the MFE (see Figure 10). Inspection of the F ratios of the analysis of variance over the first 10 trial blocks indicate that the main effects of age were highly significant ( $F = 24.98$ ,  $df = 2/84$ ,  $p < .001$ , Table XI, page 88). Differences due to sex were highly significant ( $F = 6.83$ ,  $df = 1/84$ ,  $p < .01$ , Table XI, page 88). The youngest age group showed a definite tendency to use pure strategy. The adults, however, with some exceptions, used all three



TABLE XI

SUMMARY OF ANALYSIS OF VARIANCE OF MFE RESPONSES OF THREE AGE GROUPS  
BY MALES AND FEMALES OVER FIRST TEN TRIAL BLOCKS  
UNDER TREATMENT III ( MULTI-PATTERN)

Source of Variance	Sum of Squares	df	Mean Square	F	p
<u>Between Subjects</u>	<u>15,589.18</u>	<u>89</u>			
Age	5,463.21	2	2,731.60	24.98	0.001
Sex	747.11	1	747.11	6.83	0.01
Age x Sex	193.53	2	96.76	0.88	0.42
Subject W Group	9,185.33	84	109.35		
<u>Within Subjects</u>	<u>8,991.00</u>	<u>810</u>			
Trials	1,793.74	9	199.30		
Age x Trials	269.77	18	14.99		
Sex x Trials	86.36	9	9.60		
Age x Sex x Trials	208.60	18	11.59		
Trials x <u>Subj. w. G.</u>	6,632.53	756	8.77		



TABLE XII

SUMMARY OF ANALYSIS OF VARIANCE OF MFE RESPONSES OF THREE AGE GROUPS  
BY MALES AND FEMALES OVER SECOND FIVE TRIAL BLOCKS  
UNDER TREATMENT III (MULTIPLE PATTERNS)

Source of Variance	Sum of Squares	df	Mean Square	F	p
<u>Between Subjects</u>	<u>10,503.13</u>	<u>89</u>			
Age	3,557.10	2	1,778.55	23.96	0.01
Sex	468.18	1	468.18	6.31	0.01
Age x Sex	241.61	2	120.81	1.63	0.20
Subject w. Group	6,236.24	84	74.24		
<u>Within Subjects</u>	<u>1,920.00</u>	<u>360</u>			
Trials	96.61	4	24.15		
Age x Trials	49.66	8	6.21		
Sex x Trials	18.12	4	4.53		
Age x Sex x Trials	44.25	8	5.53		
Trials x Subj. w. G.	1,711.36	336	5.09		



TABLE XIII

SUMMARY OF ANALYSIS OF VARIANCE OF CR OF THREE AGE GROUPS  
BY MALES AND FEMALES OVER FIRST TEN TRIAL BLOCKS  
UNDER TREATMENT III (MULTI-PATTERN)

Source of Variance	Sum of Squares	df	Mean Square	F	p
<u>Between Subjects</u>	<u>2,798.93</u>	<u>89</u>			
Age	257.22	2	128.60	4.31	0.02
Sex	28.44	1	28.44	0.95	0.33
Age x Sex	7.11	2	3.55	0.12	0.89
Subjects W Group	2,506.16	84	29.85		
<u>Within Subjects</u>	<u>4,816.60</u>	<u>810</u>			
Trials	639.60	9	71.07		
Age x Trials	152.32	18	8.46		
Sex x Trials	82.73	9	9.19		
Age x Sex x Trials	87.58	18	4.87		
Trials x Subj. w. G.	3,854.37	756	5.10		



strategies and usually in this order -- mixed, pure, and finally maximizing with a partially correct patterned response strategy. The middle age group did not respond to the patterns at all in this treatment but tried to match the probabilities of the events by using a mixed strategy.

From the CR curves (Figure 11) it may be seen that the adult group had the highest number of correct responses. The youngest age group were next in number of correct responses in their use of "pure" strategy. The middle age group had the least success with their mixed strategy, attempting to match the probabilities of the events with their distribution of responses. The differences in number of correct responses as a result of the multiple pattern of Treatment III for the three age groups was significant only at the  $p < .02$  level (Table XIII). Sex differences in terms of number of correct responses were not significant ( $F = .95$ ,  $df = 1/84$ ,  $p > .33$ , Table XIII).

Sex differences: The second hypothesis serves to test for sex differences of the two younger age groups. It was hypothesized that during the 10th trial block the females would realize a significant number of correct responses more than the males would. The results did not support the hypothesis and in fact it pointed in the opposite direction to the one hypothesized. The non-significant differences as to the number of correct responses realized by each sex within each of these two younger age groups is presented graphically in Figures 12 to 14 in the following pages. This is further supported by the analysis of variance summarized in Tables XIV to XVII, pp. 96 - 99.



Although there are indications of significant sex differences of the MFE responses in Tables XI and XII, further analysis of the MFE data established the difference to be significant only for the unhypothesized adult age group. In any case, the realized success of correct responses for each of the three age groups was non-significant (Table XIII). Therefore, it may be concluded that both sexes realized about the same success. It is suggested by the investigator that perhaps the age categories are too wide to show any differences between them that may be due to maturation.



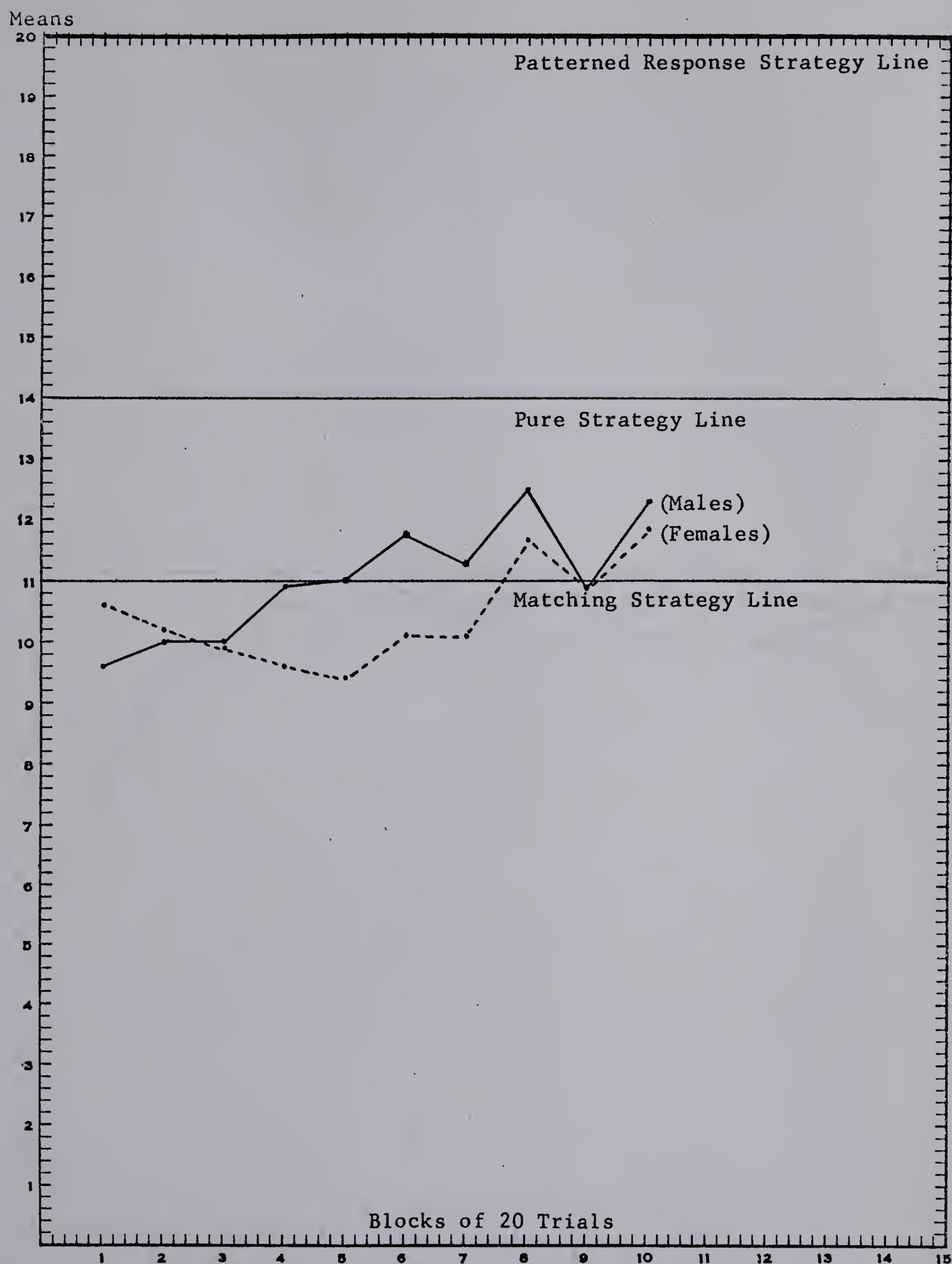


FIGURE 12

CR CURVES OF THE 4-6 YEAR AGE GROUP UNDER TREATMENT III



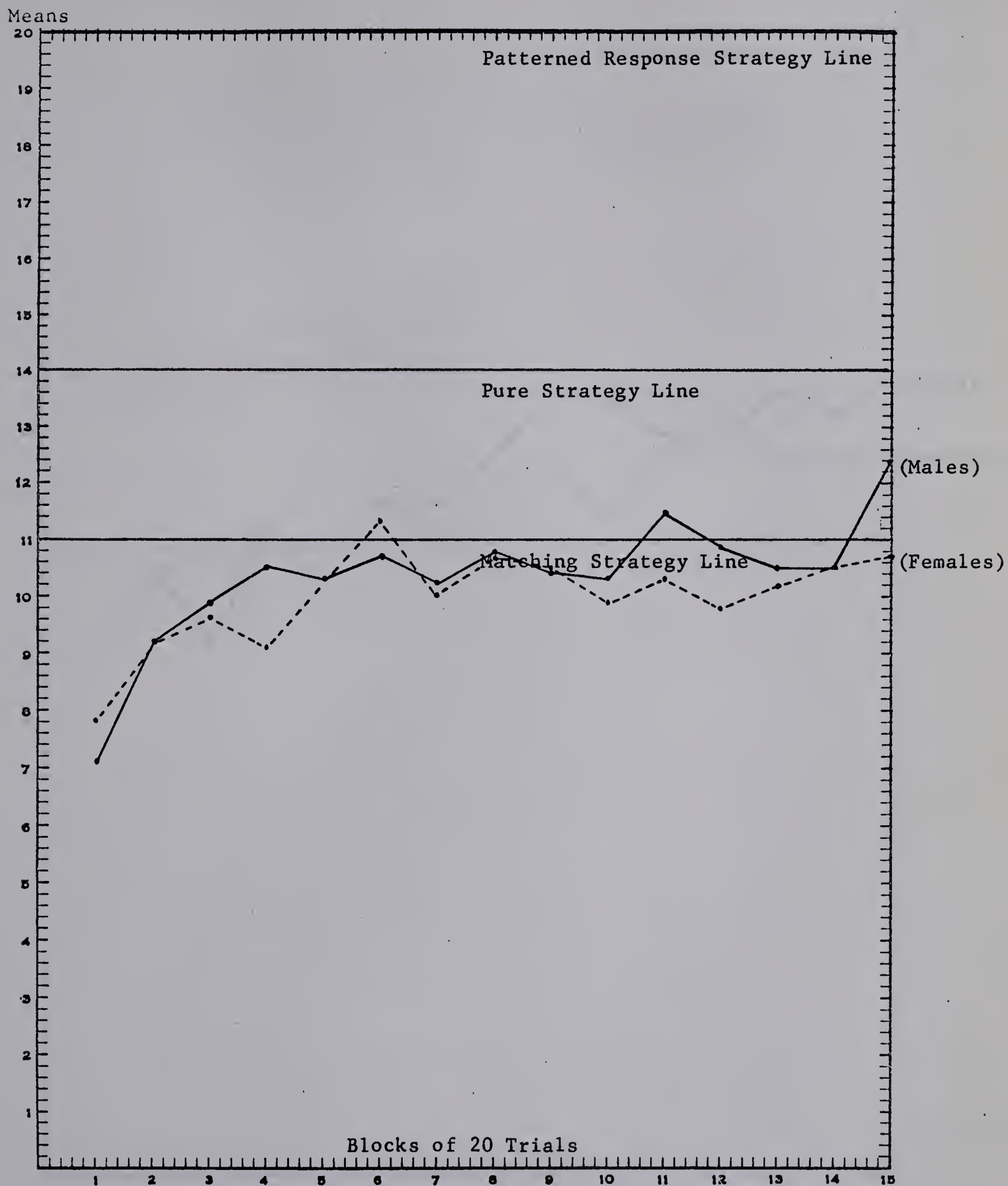


FIGURE 13

CR CURVES OF THE 7-10 YEAR AGE GROUP UNDER TREATMENT III



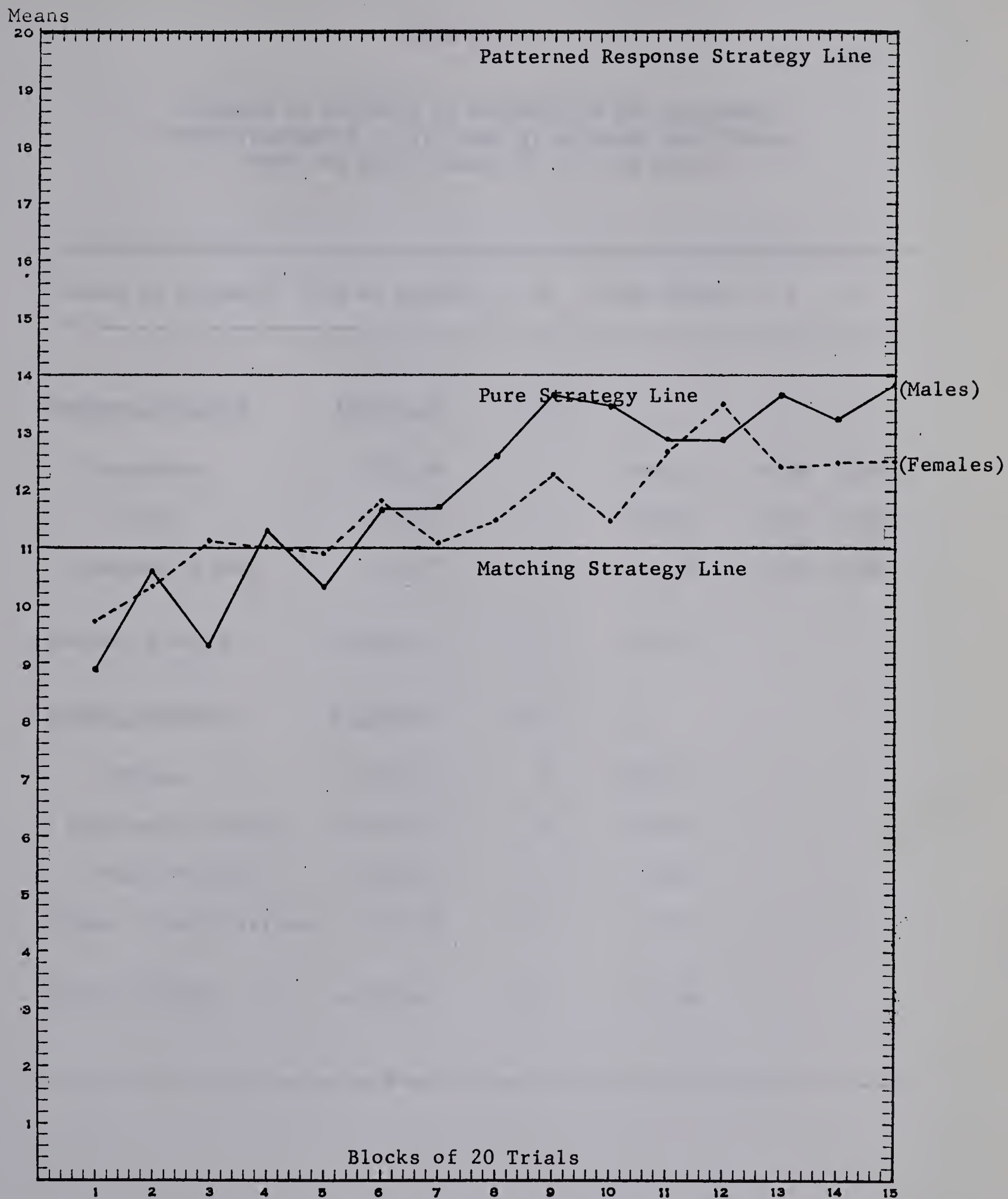


FIGURE 14

CR CURVES OF THE ADULT GROUP UNDER TREATMENT III



TABLE XIV

SUMMARY OF ANALYSIS OF VARIANCE OF MFE RESPONSES  
UNDER TREATMENTS I, II, AND III BY MALES AND FEMALES  
OVER TEN TRIAL BLOCKS OF 4-6 AGE GROUP

Source of Variance	Sum of Squares	df	Mean Square	F	p
<u>Between Subjects</u>	<u>10,781.11</u>	<u>89</u>			
Treatments	1,837.39	2	918.70	8.96	0.001
Sex	319.22	1	319.22	3.11	0.08
Treatment x Sex	15.37	2	7.68	0.07	0.93
Subject W Group	8,609.13	84	102.49		
<u>Within Subjects</u>	<u>21,302.40</u>	<u>810</u>			
Trials	2,721.31	9	302.37		
Treatment x Trials	6,372.74	18	354.04		
Sex x Trials	230.63	9	25.63		
Treat. x Sex x Trials	79.12	18	4.40		
Trials x Subj. w. G.	11,898.60	756	15.74		



TABLE XV

SUMMARY OF ANALYSIS OF VARIANCE OF CR  
 UNDER TREATMENTS I, II, AND III BY MALES AND FEMALES  
 OVER TEN TRIAL BLOCKS OF 4-6 AGE GROUP

Source of Variance	Sum of Squares	df	Mean Square	F	p
<u>Between Subjects</u>	<u>3,754.36</u>	<u>89</u>			
Treatments	198.85	2	99.42	2.42	0.09
Sex	104.04	1	104.04	2.54	0.12
Treatment x Sex	6.41	2	3.20	0.08	0.92
Subjects W Group	3,445.07	84	41.01		
<u>Within Subjects</u>	<u>6,806.00</u>	<u>810</u>			
Trials	1,372.07	9	152.45		
Treatment x Trials	567.78	18	31.54		
Sex x Trials	54.34	9	6.04		
Treat. x Sex x Trials	80.88	18	4.49		
Trials x Subj. w. G.	4,730.93	756	6.26		



TABLE XVI

SUMMARY OF ANALYSIS OF VARIANCE OF MFE RESPONSES  
 UNDER TREATMENTS I, II, AND III BY MALES AND FEMALES  
 OVER FIFTEEN TRIAL BLOCKS OF 7-10 AGE GROUP

Source of Variance	Sum of Squares	df	Mean Square	F	p
<u>Between Subjects</u>	<u>24,275.94</u>	<u>89</u>			
Treatments	9,682.19	2	4,841.09	28.13	0.001
Sex	65.78	1	65.78	0.38	0.54
Sex x Treatment	69.38	2	34.69	0.20	0.82
Subject W Group	14,458.60	84	172.13		
<u>Within Subjects</u>	<u>24,862.40</u>	<u>1260</u>			
Trials	3,729.83	14	266.42		
Treatment x Trials	11,544.06	28	412.29		
Sex x Trials	115.44	14	8.25		
Treat. x Sex x Trials	312.60	28	11.16		
Trials x Subj. w. G.	9,160.47	1176	7.79		



TABLE XVII

SUMMARY OF ANALYSIS OF VARIANCE OF CR  
 UNDER TREATMENTS I, II, AND III BY MALES AND FEMALES  
 OVER FIFTEEN TRIAL BLOCKS OF 7-10 AGE GROUP

Source of Variance	Sum of Squares	df	Mean Square	F	p
<u>Between Subjects</u>	<u>6,231.17</u>	<u>89</u>			
Treatment	605.37	2	302.68	4.68	0.01
Sex	22.95	1	22.95	0.45	0.55
Treatment x Sex	166.14	2	83.07	1.28	0.28
Subjects W Group	5,436.72	84	64.72		
<u>Within Subjects</u>	<u>8,806.40</u>	<u>1260</u>			
Trials	1,578.84	14	112.77		
Treatment x Trials	629.23	28	22.47		
Sex x Trials	119.97	14	8.57		
Treat. x Sex x Trials	129.35	28	4.62		
Trials x Subj. w. G.	6,349.01	1176	5.40		



TABLE XVIII

SUMMARY OF ANALYSIS OF VARIANCE OF MFE RESPONSES  
UNDER TREATMENTS I, II, AND III BY MALES AND FEMALES  
OVER FIFTEEN TRIAL BLOCKS OF THE ADULT GROUP

Source of Variance	Sum of Squares	df	Mean Square	F	p
<u>Between Subjects</u>	<u>15,897.63</u>	<u>89</u>			
Treatment	10,373.02	2	5,186.51	99.30	0.001
Sex	776.72	1	776.72	14.87	0.001
Treatment x Sex	360.36	2	180.18	3.45	0.04
Subjects W Group	4,387.53	84	52.23		
<u>Within Subjects</u>	<u>24,177.07</u>	<u>1260</u>			
Trials	4,400.83	14	314.34		
Treatment x Trials	12,281.38	28	438.62		
Sex x Trials	214.12	14	15.29		
Treat. x Sex x Trials	229.87	28	8.21		
Trials x Subj. w. G.	7,050.87	1176	5.99		



TABLE XIX

SUMMARY OF ANALYSIS OF VARIANCE OF CR  
 UNDER TREATMENTS I, II, AND III BY MALES AND FEMALES  
 OVER FIFTEEN TRIAL BLOCKS OF ADULT GROUP

Source of Variance	Sum of Squares	df	Mean Square	F	p
<u>Between Subjects</u>	<u>11,020.98</u>	<u>89</u>			
Treatment	7,354.37	2	3,677.18	84.76	0.001
Sex	5.87	1	5.87	0.14	0.71
Treatment x Sex	16.58	2	8.29	0.19	0.83
Subjects W Group	3,644.17	84	43.38		
<u>Within Subjects</u>	<u>10,805.33</u>	<u>1260</u>			
Trials	3,770.37	14	269.31		
Treatment x Trials	1,029.74	28	36.78		
Sex x Trials	78.03	14	5.57		
Treat. x Sex x Trials	121.36	28	4.33		
Trials x Subj. w. G.	5,805.83	1176	4.94		



## CHAPTER VII

### SUMMARY, FINDINGS, CONCLUSIONS AND IMPLICATIONS

This final chapter includes a statement of the problem and its purpose; an overview of the experiment; the findings of the experiment, the results of the experiment and how they relate to the hypothesis; the conclusions; the implications for education -- theoretical and practical; and the implications for further research.

#### The Problem and Its Purpose

The problem under investigation is to show that choice behavior is predictable by Piagetian theory and to suggest what cognitive processes are operant in choice behavior at different age levels. The strategies (mixed, pure and patterned response) used by each age group were taken as indicative of the type of cognitive processes which are available at that developmental level. The three age groups used in this study are based on the phases and periods of Piaget's theory, particularly the concrete operations and formal operations period.

The purpose of this study is to explain how certain strategies are used and how they seem to be associated with certain stages of cognitive development.

#### Overview of the Study

This investigation was designed to study the behavior of three age groups under three treatments over a series of repeated blocks of



trials in a probability learning task. The number of subjects of each sex was equal in each age group and in each treatment. Two hundred seventy subjects were used to give an N of 15 in each of 18 possible cells.

The three treatments varied in the patterning of events: random events (I), single simple pattern (II), and multiple patterns (III). The treatments were designed to distinguish between age groups by means of progressive complexity of treatments, by the type of strategies employed, and by the possibility for abstraction of information. All treatments are under the condition of rewards with the utility assigned by the subject. In each treatment sex differences are considered.

A three-event situation was used in this experiment. The task was the same for each of the three treatments in the sense that the subject was seated at a work station and asked to predict which of three possible events would occur in each trial. Ten blocks of twenty trials each succeeded one another in the series for the 4-6 year age group; fifteen blocks of twenty trials were used for the other two groups.

Equipment used was a Stoelting five channel programmer which not only provided proper cycle timing but also provided the programming of each treatment on a program of film tape. An Esterline-Angus 20 pen recorder provided a continuous record of the subject's responses as well as the programmed correct event for each light at each of the



three work stations. An attendant was stationed at each work area in order to assist in the orientation of subjects.

Two types of information were obtained from the 20 pen recorder roll charts: the total number of responses to each event in each block of twenty trials and the number of correct responses to each event in each block of twenty trials. From this information was extracted the number of responses to the most frequent event (MFE) and total correct responses (CR) for each trial block.

#### EXPERIMENTAL FINDINGS

Hypothesis 1 (a): It was found that the three age groups could be divided into three groups according to the strategies (based upon MFE responses) they used and/or the number of correct responses (CR) they realized in predicting the events. On the basis of strategies used and the correct responses realized, the 4-6 year age group and the adult group at the end of ten trials generally used pure strategy or were approaching a pure strategy. On the other hand, the 7-10 year age group, as a group, used some form of mixed strategy. However, this should not be construed that all subjects in the 7-10 year age group used mixed strategy, since eleven of them eventually did use pure strategy.

Hypothesis 1 (b): In this study the 7-10 year age group and the adults both reached their respective asymptotic level of choice behavior at about the same time; that is, after the same number of



trials. The 4-6 year age group took the longest time -- about 80 trials longer.

Hypothesis 1 (c): There were no significant sex differences in choices within the age groups.

Hypothesis 2 (a): It was found that only the adults were able to detect the pattern, learn it, and use a patterned response strategy. The other two groups behaved similarly over the first five trial blocks. From that point onward the 4-6 year age group displayed a tendency toward "pure" strategy whereas the 7-10 year age group displayed a tendency toward mixed strategy until the point of the reversal shift.

Hypothesis 2 (b): After the reversal shift the adults were able to make the appropriate adjustment quickly and to recover in about 28 trials. The 7-10 year age group took about 58 trials to recover, while the youngest group, which had the most difficulty in making a recovery, had not yet fully recovered by the end of their trials. Five 4-6 year-olds did not make the shift at all but continued to respond to the event upon which they had centered previous to the reversal shift.

Hypothesis 2 (c): There were no significant sex differences within any of the three groups.

Hypothesis 3 (a): There was a significant separation of the three age groups on the basis of their MFE response curves. The 4-6 year age group displayed a definite tendency as a group to use pure strategy and ignore patterns. The 7-10 year age group used a mixed



strategy but they too failed to respond to the patterns. As a result they had the lowest number of correct responses. The adults, with exceptions, used all three strategies. Usually, they began with a mixed strategy, then tried a pure strategy and continued with it, or they went on to generate a partially correct patterned response strategy.

Hypothesis 3 (b): Within the limits of this study, no significant sex differences may be attributed to maturation.

### GENERAL CONCLUSIONS

#### 4-6 Year Age Group

From the findings of this study it may be concluded that the 4-6 year olds, taken as a group and notwithstanding some individual differences, perceived the events to be random in each of the three treatments. Because they did perceive the events to be random, they resolved the probability learning task in all three conditions by eventually responding to the most frequent event (MFE). As soon as they became aware of the MFE they concentrated on it, responded to it, and gradually appeared to be conditioned to it. However, some did invoke a mixed strategy during the earlier trial blocks of the series. As a group, though, they displayed a tendency toward pure strategy with the result that most of them finalized on a pure strategy.

The findings also indicate that members of the 4-6 year age group were unable to detect the patterning of event sequences. This



failure to detect patterns gives support to the theory that during the intuitive phase of development they are unable to obtain maximum benefit from their experience because they cannot abstract from it. This inability to abstract also prevents them from acquiring a schema for patterns which is necessary for both detecting and efficiently learning a pattern.

There is support for the hypothesis that this age group, by centrating on the MFE, are susceptible of becoming conditioned to it. Members of this group took the longest time to make an appropriate shift after the reversal shift in Treatment II. Especially is this evident in those subjects who did not ever make the appropriate accommodation to the shift but who continued to respond to the previous MFE.

In a repetitive probability-learning task the 4-6 year olds cannot set for themselves long range goals; instead they are tied to their perceptions and respond on the concrete level from the particular to the particular. In a repetitive task such as the one in this experiment, they need to realize some sort of reward or they will soon become tired and abandon the task.

#### 7-10 Year Age Group

With a few exceptions (four individuals), the 7-10 year age group behaved as did the youngest group in perceiving the events to be random. Yet they tried to impose a meaning upon the task by constantly searching for the best solution to the task. Because they are still tied to the concrete level of operations, this search leads to a



matching of event probabilities and a lower correct response (CR) level than that of the other two groups. This lowered CR is vividly demonstrated in Treatment II (simple pattern) and Treatment III (multi-pattern). It was apparent that they were unable to abstract from their experiences those facts which would lead to detection and learning of patterns. This observation supports the theory of concrete operations for the age group. Although they operate largely on the concrete level, as do the 4-6 year olds, this group is able to "decentrate" and do not become conditioned to the MFE as the youngest group did. This is evidenced in the more rapid recovery from the effect of the reversal shift. However, this recovery was slower than that of the adult group.

In the very complex situation (multiple patterns) they were unable to respond even with partial patterning. This is further evidence of their concrete operation and inability to utilize formal operations, as a result of which their CR in Treatment III was even lower than that of the youngest group.

#### Adult Group

The findings support the theory that the adults are using formal operations. Unlike the two younger groups, they were able to differentiate between the events that were randomized and those that were patterned. It appears that they were able to learn from their experience and to abstract from it information with which to develop strategies that they thought would yield the highest number of correct responses. They displayed a tendency to use pure strategy for random events, a



patterned response strategy for simple pattern while using varied strategies in response to the multi-pattern treatment. In the complex situations some were able to generate partially correct response patterns and others used either a pure strategy or some variation of a mixed strategy.

When confronted with a reversal shift, the adults very quickly made the proper shift. In all three treatments they displayed some degree of control of the situation as they attempted to maximize their subjective utility. It was noted that in at least two cases preconceived ideas (sets) had an inhibiting effect and prevented these individuals from learning the patterns.

All three age groups, it may be added, displayed a maximizing choice behavior and reached an asymptotic level of behavior at about 120 trials, except for the youngest group whose behavior did not yet indicate a stable state. Differences of strategy in response to events among the three age groups were greatest where events were patterned, especially in the multi-pattern treatment. There is reason to conclude that learning of patterned events is a formal operation task. Sex differences were not significant.

## IMPLICATIONS

### 1. Theoretical

The theoretical rationale of this study has received support from the experimental findings. The verification of the various



hypotheses adds credence to the postulates and assumptions from which they were derived. Specifically, the different developmental phases and periods, as outlined by Piaget, provide valid chronological groupings of subjects for experimentation. At the same time Piaget's theory provides a description of the cognitive abilities expected at these phases and periods of development.

Although the subjects in a repetitive probability-learning task do reach an asymptote over a number of trials, the groups do differentiate between themselves through the strategies they use. Especially is this evident when it is necessary to abstract information from the results of a series of events. It has been shown that it is possible to design and generate complexity by using patterns. Furthermore, the study adds to the knowledge and theory regarding response to patterns: they are a formal operations task.

## 2. Practical

The strategies that have been defined and the treatments that have been used in this study should prove to be useful for the following purposes:

- a. Identification of strategies in a probability-learning task;
- b. Distinguishing between various age groups in cognitive development;
- c. Identification of stage of cognitive development;
- d. Generation of various degrees of complexity by use of patterns in a probability-learning task;



- e. Provision of a basis for identification of abstract thinking.

### 3. Implications for Further Research

A more detailed study is necessary which would utilize more age groupings in which the age differential within each group would be a maximum of two years. Such a study would indicate more precisely at what approximate age levels cognitive processes actually do change and at what age the transition from one phase or stage of Piagetian development to another might be expected. Further study could also indicate how quickly this transition between stages or phases takes place.

Future research should be carried out further to validate and confirm the finding that recognition of and response to pattern in a probability - learning task is a formal operations task characteristic of the adult group.

A study should also be designed to investigate the possibility for the other two groups (4 to 6 years old, and 7 to 10 years old) having a notion -- that is, an underdeveloped schema -- of patterns and not being able to verbalize it. Also, it might be that the middle group (7 to 10 year olds) do have a schema for patterns but fail to abstract from the events the pattern that exists within the sequence.

The findings of additional research should also be subjected to further comparison of a replicated study to maximize the reliability and validity of this study.



## BIBLIOGRAPHY



## BIBLIOGRAPHY

- Anderson, N. H. Effect of first-order conditional probability in a two-choice learning situation. J. exp. Psychol., 1960, 59, 73-93.
- Bernoulli, D. Specimen theorie novae de mensura sortis. Comentarii Academiae Scientiarum Imperiales Petropolitanae, 1738, 5, 179-192. Translated by L. Sommer, Econometrica, 1954, 22, 23-36.
- Brackbill, Yvonne, Kappy, M.S. and Starr, R. H. Magnitude of reward and probability learning. J. exp. Psychol., 1962, 63, 32-35.
- Berlyne, D. E. Recent developments in Piaget's work, 1957. In Harper, R. J. C. et al (eds.), The cognitive processes: readings, Englewood Cliffs, Prentice-Hall, Inc., 1964.
- Bruner, J. S., Goodnow, J. J. and Austin, G. A. A study of thinking. New York, Science Editions, Inc., 1962.
- Brunswik, E. and H. Herma, Probability learning of perceptual cues in the establishment of a weight illusion, Jrnl. of Exp. Psychol., 1951, 41, 281-90.
- Brunswik, W. Probability as a determiner of rat behavior. J. exp. Psychol., 1939, 25, 175-197.
- Brunswik, W., Organismic achievement and environmental probability, Psychol. Rev., 1943, 50, 255-272.
- Bush, R. R. and Estes, W. K. (eds.) Studies in mathematical learning theory. Stanford, Calif.: Stanford Univer. Press, 1959.
- Cohen, A. R. Cognitive tuning as a factor affecting impression formation. Jrnl. of personality, 1961, 29, 235-245.
- Cohen, J. Chance, skill, and luck. London, Penguin Books, 1960.
- Cohen, J. and Hansel, M. Risk and gambling. London, Longmans, Green and Co., 1956.
- Cohen, J. and Hansel, C. E. M. The idea of independence. Brit. J. Psychol., 1955, 46, 178-190.
- Coleman, J. C. Personality dynamics and effective behavior. Chicago, Scott, Foresman and Co., 1960.
- Chown, S. M. Rigidity - A flexible concept. Psychol. Bull., 1959, 56, 195-223.



- Craig, Grace J., and Myers, J. L. A developmental study of sequential two-choice decision making. Child Develpm., 1963, 34, 483-492.
- Davidson, D., Suppes, P., and Siegel, S. Decision making: an experimental approach. Stanford, Calif.: Stanford Univer. Press., 1957.
- Duncan, C. P. Recent research on human problem solving. Psychol. Bull., 1959, 56, 397-429.
- Edwards, W. Behavioral decision theory. Annual Review of Psychology, 1961, 12, 473.
- Edwards, W. The theory of decision making. Psychol. Bull., 1954, 51, 380-417.
- Estes, W. K. Individual behavior in uncertain outcome situations: an interpretation in terms of statistical association theory. In R. M. Thrall, C. H. Coombs, and R. L. Davis (eds.), Decision processes. New York: Wiley, 1954, 127-137.
- Estes, W. K. The statistical approach to learning theory. In S. Koch (ed.), Psychology: a study of a science, vol. 2, New York: McGraw-Hill, 1959.
- Estes, W. K. Toward a statistical theory of learning. Psychol. Rev., 1950, 57, 94-107.
- Estes, W. K., and Burke, C. J. A theory of stimulus variability in learning. Psychol. Rev., 1953, 60, 276-286.
- Flavell, J. H. The developmental psychology of Jean Piaget. Princeton, N. J.: van Nostrand, 1963.
- Gaberman, J. An empirical test of the Siegel-McMichael model for prediction of decision-making behavior in a k-choice uncertain outcome situation. Unpublished doctoral dissertation, Pennsylvania State University, 1962.
- Gardner, R. A. Probability-learning with two and three choices. Amer. J. Psychol., 1957, 70, 174-185.
- Gardner, R. A. Multiple-choice decision-behavior. Amer. J. Psychol., 1958, 71, 710-717.
- Goodnow, J. J. and Pettigrew, T. F. Effect of prior patterns of experience upon strategies and learning sets. J. exp. Psychol., 1955, 49, 381-389.



- Goodnow, J. J. and Pettigrew, T. F. Some sources of difficulty in solving simple problems. J. exp. Psychol., 1956, 51, 385-392.
- Grant, D. A., Hake, H. W., and Hornseth, J. P. Acquisition and extinction of a verbal conditioned response with varying percentages of reinforcement. J. exp. Psychol., 1951, 42, 1-5.
- Gratch, G. The development of the expectation of the nonindependence of random events in children. Child Developm., 1959, 30, 217-227.
- Gruen, G. F. and Weir, M. W. The effect of instruction, penalty, and age on probability learning. Child Developm., 1964, 35, 265-274.
- Hake, H. W. and Hyman, R. Perception of the statistical structure of a random series of binary symbols. J. exp. Psychol., 1952, 45, 64-74.
- Harper, R. J. C., Anderson, C. C., Christensen, C. M., and Hunka, S. M. The cognitive processes: readings. Englewood Cliffs, Prentice-Hall, Inc., 1964.
- Hull, C. L. Principles of behavior. New York, Appleton-Century-Crofts, Inc., 1943.
- Humphreys, L. G. Acquisition and extinction of verbal expectations in a situation analogous to conditioning. J. exp. Psychol., 1939, 25, 294-301.
- Hunt, J. McV. Intelligence and experience. New York: Ronald Press, 1961.
- Hyman, R. and Jenkins, N. W. Involvement and set as determinants of behavioral stereotypy. Psychol. Rep., 1956, 2, 131-146.
- Inhelder, Barbel and Piaget, J. The growth of logical thinking from childhood to adolescence: An essay on the construction of formal operational structures. (Trans. by Anne Parsons and S. Milgram) New York: Basic Books, 1958.
- Jarvik, M. E. Probability learning and a negative recency effect in the serial anticipation of alternative symbols. J. exp. Psychol., 1951, 41, 291-297.
- Jonckheere, A. R. A distribution-free k-sample test against ordered alternatives. Biometrika, 1954, 41, 133-145.



- Jones, M. H. and Liverant, S. Effects of age differences on choice behavior. Child Developm., 1960, 31, 673-680.
- Kendler, Tracy S. Development of mediating responses in children. Monogr. Soc. Res. Child Developm., 1963, 28(No. 2), 33-48.
- Kendler, H. H. and Kendler, Tracy S. Vertical and horizontal processes in problem solving. Psychol. Rev., 1962, 69, 1-16.
- Kessen, W. and Kessen, Marion L. Behavior of young children in a two-choice guessing problem. Child Developm., 1961, 32, 779-788.
- Kuenne, M. R. Experimental investigation of the relation of language to transposition behavior in young children. Journal of Experimental Psychology, 1946, 36, 471-490.
- Luria, A. R. The development of the regulatory role of speech, (1961), In Harper, R.J.C. et al (eds.) The cognitive processes: readings. Englewood Cliffs, Prentice-Hall Inc., 1964.
- Maddi, S. R. and Berne, N. Novelty of productions and desire for novelty as active and passive forms of the need for variety. Journal of Personality, 1964, 32, No. 2, 270-277.
- Marks, R. W. The effect of probability, desirability, and "privilege" on the stated expectations of children. Journal of Political Economics, 1946, 54, 97-115.
- McKendry, J. M. Decision making behavior in a complex three-choice uncertain outcome situation. Unpublished doctoral dissertation, Pennsylvania State University, 1961.
- Messick, S. and Brayfield, A. H. (eds.) Decision and choice: contributions of Sidney Siegel. New York: McGraw-Hill Book Company, 1964.
- Messick, S. J. and Solley, C. M. Probability learning in children: some exploratory studies. J. genet. Psychol., 1957, 90, 23-32.
- Miller, G. A. Psychology, the science of mental life. New York, Harper and Row, 1962.
- Morse, E. B. and Runquist, W. N. Probability-matching with an unscheduled random sequence. Amer. J. Psychol., 1960, 73, 603-607.
- Pereboom, A. C. and Crawford, B. M. Instrumental and competing behavior as a function of trials and reward magnitude, J. exp. Psychol., 1958, 56, 82-85.



- Piaget, J. La formation du symbole chez l'enfant. (Orig. publ. 1945) (Play, dreams, and imitation in childhood) (Trans. by C. Cattegno and F. M. Hodgson) New York: Norton, 1951.
- Piaget, J. Logic and psychology, Manchester, University Press, 1953.
- Piaget, J. The construction of reality in the child. (Orig. pub. 1937) (Trans. by Margaret Cook) New York: Basic Books, 1954.
- Piaget, J. The psychology of intelligence. Paterson, N. J., Littlefield, Adams & Co., 1963.
- Powell, M. The psychology of adolescence, New York, Bobbs-Merrill Company, Inc., 1963.
- Radlow, R. A theory of learning for partially reinforced binary choice behavior. Department of Psychology Research Bulletin No. 10. State College, Pa.: Penna. State Univer. 1960.
- Radlow, R. and Siegel, S. Decision making and learning. Department of Psychology Research Bulletin No. 6. State College, Pa.: Penna. State Univer., 1960.
- Ross, B. M. and Levy, N. Patterned predictions of chance events by children and adults. Psychol. Rep., 1958, 4, 87-121.
- Siegel, S. Choice, strategy, and utility. In collaboration with A. E. Siegel and J. M. Andrews, New York, McGraw-Hill Book Company, 1964.
- Siegel, S. Theoretical models of choice and strategy behavior: stable state behavior in the two-choice uncertain outcome situation. Psychometrika, 1959, 24, 303-316.
- Siegel, S. Decision making and learning under varying conditions of reinforcement. Annals of the New York Academy of Sciences, 1961, 89, Art. 5, 766-783.
- Siegel, S. and Goldstein, D. A. Decision-making behavior in a two-choice uncertain-outcome situation. J. exp. Psychol., 1959, 57, 37-42.
- Siegel, S. and McMichael, Julia E. Individual choice and strategy behavior: a general model for repeated choices. Department of Psychology Research Bulletin No. 11. State College, Pa.: Penna. State Univer., 1960.



- Skinner, B. F. The behavior of organisms. New York, Appleton-Century-Crofts, Inc., 1938.
- Sloan, H. S. and Zurcher, A. J. A dictionary of economics. New York, Barnes, and Noble, Inc., 1953.
- Stevenson, H. W., Iscoe, I., and McConnell, C. A developmental study of transportation. J. exp. Psychol., 1955, 49, 278-280.
- Stevenson, H. W. and Weir, M. W. Variables affecting children's performance in a probability learning task. J. exp. Psychol., 1959, 57, 403-412.
- Stevenson, H. W. and Weir, M. W. The role of age and verbalization in probability learning. Amer. J. Psychol., 1963, 76, 299-302.
- Stevenson, H. W. and Zigler, E. F. Probability learning in children. J. exp. Psychol., 1958, 56, 185-192.
- Von Neumann, J. and Morgenstern, O. Theory of games and economic behavior (2nd ed.). Princeton, N.J.: Princeton, 1947.
- Vygotsky, L. S. Language and thought. Edited and translated by E. Haufmann and G. Vakar. Cambridge, M.I.T. Press, Mass. Inst. of Tech., 1962.
- Weir, M. W. Developmental changes in problem-solving strategies. Psychological Review, 1964, 71, 473-490.
- Weir, M. W. Effects of age and instruction on children's probability learning. Child Develpm., 1962, 33, 729-735.
- Winer, B. J. Statistical principles in experimental design, New York: McGraw-Hill Book Co., Inc., 1962.
- Yost, P. A., Siegel, A. E., and Andrews, J. M. Nonverbal probability judgments by young children. Child Develpm., 1962, 33, 769-780.
- Zajonc, R. B. The process of cognitive tuning in communication. J. abnormal soc. psychol., 1960, 61, 159-167.



## A P P E N D I C E S



APPENDIX A



TABLE XX

## SAMPLE CHARACTERISTICS

	Sample Population								
	T <sub>1</sub>			T <sub>2</sub>			T <sub>3</sub>		
	M	F	T	M	F	T	M	F	T
<b>Group I - 4-6 Years</b>									
Bonnie Doon	-	-	-	3	14	17	-	-	-
Creche Day Nursery	13	15	28	4	1	5	-	-	-
Grandview	-	-	-	-	-	-	3	-	3
Jasper Place	-	-	-	-	-	-	3	10	13
Lacombe Camp Meeting	4	3	7	1	3	4	1	-	1
Montessori	-	-	-	8	7	17	-	1	1
Whitecroft Comm. League	-	-	-	-	-	-	9	6	15
Totals	17	18	35	16	25	41	16	17	33
Mean Age	5.2	5.3	5.3	5.0	5.0	5.0	4.7	5.1	4.9
Mean Years at School	-	-	-	-	-	-	-	-	-
<b>Group II - 7-10 Years</b>									
Edmonton City	-	-	-	3	-	3	-	-	-
Lacombe Camp Meeting	15	16	31	18	18	36	6	12	18
Whitecroft Comm. League	-	-	-	-	-	-	10	5	15
Totals	15	16	31	21	18	39	16	17	33
Mean Age	8.3	8.8	8.5	8.2	8.2	8.2	8.6	9.0	8.8
Mean Years at School	3.3	3.8	3.5	3.1	3.4	3.2	3.2	4.1	3.6
<b>Group III - Adult</b>									
Elementary School	-	1	1	-	-	-	-	-	-
Lacombe Camp Meeting	-	-	-	1	1	2	-	-	-
Royal Alexandra Hospital	-	12	12	-	4	4	1	11	11
University of Alberta	16	4	20	15	10	25	18	4	22
Whitecroft Comm. League	-	1	1	-	-	-	3	-	3
Others	-	-	-	1	1	2	1	2	2
Totals	16	18	34	17	16	33	21	17	38
Mean Age	22.0	19.0	20.0	27.6	25.0	26.3	27.6	25.0	26.3
Mean Years at School	15.0	13.5	14.0	15.6	14.3	15.0	15.6	14.3	15.0



Age \_\_\_\_\_ Station \_\_\_\_\_  
 Education \_\_\_\_\_ Male \_\_\_\_\_ Female \_\_\_\_\_  
 Tokens \_\_\_\_\_

Name: \_\_\_\_\_ Subject Number: \_\_\_\_\_

Treatment: \_\_\_\_\_ Sequence: \_\_\_\_\_ Date: \_\_\_\_\_

### POST-EXPERIMENT QUESTIONNAIRE

1. What did you think was expected of you in this experiment?
2. (a) Did the pattern of the lights - the way in which they came on - remain the same throughout the experiment? Yes \_\_\_\_\_ No \_\_\_\_\_  
 (b) If not, how did it change, and could you estimate how many different patterns were employed?
3. Would you please estimate the relative frequency with which each of the lights came on - on the basis of 100% of the experimental trials.  
 Left \_\_\_\_\_% Middle \_\_\_\_\_% Right \_\_\_\_\_%
4. (a) Did the experiment hold your interest? Yes \_\_\_\_\_ No \_\_\_\_\_  
 (b) If S became bored: Could you estimate about when you first became bored, and how long it lasted? (Give percentage of time.)  
 \_\_\_\_\_% of total time.  
 (c) Did you do anything deliberately to combat this boredom?  
 Yes \_\_\_\_\_ No \_\_\_\_\_
5. If you had a friend who was going to play exactly this same game and if you and he were to split his profits, how would you advise him to play? Pattern \_\_\_\_\_ Left \_\_\_\_\_% Middle \_\_\_\_\_% Right \_\_\_\_\_%
6. (a) Did you feel that what the machine did was influenced by your actions at all? Yes \_\_\_\_\_ No \_\_\_\_\_  
 (b) If so, in what way?
7. (a) Have you ever participated in a study of this type before?  
 Yes \_\_\_\_\_ No \_\_\_\_\_  
 (b) If so, when was the study run, and what did it consist of?



# BLANKS OF 20 TRIALS

[illegible]

123

EXHIBIT 2

Name

Subj.	No.	Treat	No.	Event
1	1	1	1	1
2	2	2	2	2
3	3	3	3	3
4	4	4	4	4
5	5	5	5	5
6	6	6	6	6
7	7	7	7	7
8	8	8	8	8
9	9	9	9	9
10	10	10	10	10
11	11	11	11	11
12	12	12	12	12
13	13	13	13	13
14	14	14	14	14
15	15	15	15	15
16	16	16	16	16
17	17	17	17	17
18	18	18	18	18
19	19	19	19	19
20	20	20	20	20
21	21	21	21	21
22	22	22	22	22
23	23	23	23	23
24	24	24	24	24
25	25	25	25	25
26	26	26	26	26
27	27	27	27	27
28	28	28	28	28
29	29	29	29	29
30	30	30	30	30
31	31	31	31	31
32	32	32	32	32
33	33	33	33	33
34	34	34	34	34
35	35	35	35	35
36	36	36	36	36
37	37	37	37	37
38	38	38	38	38
39	39	39	39	39
40	40	40	40	40
41	41	41	41	41
42	42	42	42	42
43	43	43	43	43
44	44	44	44	44
45	45	45	45	45
46	46	46	46	46
47	47	47	47	47
48	48	48	48	48
49	49	49	49	49
50	50	50	50	50
51	51	51	51	51
52	52	52	52	52
53	53	53	53	53
54	54	54	54	54
55	55	55	55	55
56	56	56	56	56
57	57	57	57	57
58	58	58	58	58
59	59	59	59	59
60	60	60	60	60
61	61	61	61	61
62	62	62	62	62
63	63	63	63	63
64	64	64	64	64
65	65	65	65	65
66	66	66	66	66
67	67	67	67	67
68	68	68	68	68
69	69	69	69	69
70	70	70	70	70
71	71	71	71	71
72	72	72	72	72
73	73	73	73	73
74	74	74	74	74
75	75	75	75	75
76	76	76	76	76
77	77	77	77	77
78	78	78	78	78
79	79	79	79	79
80	80	80	80	80
81	81	81	81	81
82	82	82	82	82
83	83	83	83	83
84	84	84	84	84
85	85	85	85	85
86	86	86	86	86
87	87	87	87	87

$E_1$	$E_2$	$E_3$	CR	$E_1$	$E_2$	$E_3$	CR	$E_1$	$E_2$	$E_3$	CR	$E_1$	$E_2$	$E_3$	CR	$E_1$	$E_2$	$E_3$	CR
-------	-------	-------	----	-------	-------	-------	----	-------	-------	-------	----	-------	-------	-------	----	-------	-------	-------	----

Treat. No.

[illegible]

Subj.

[illegible]





THE NEW YORK PUBLIC LIBRARY ASTOR LENOX TILDEN FOUNDATION 1215 6TH AVENUE NEW YORK 17, N.Y.

1911

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THE NEW YORK PUBLIC LIBRARY ASTOR LENOX TILDEN FOUNDATION 1215 6TH AVENUE NEW YORK 17, N.Y.

TABLE XXI

## SUMMARY OF POST-TEST QUESTIONNAIRE REPLIES

QUESTION:	GROUP I			GROUP II			GROUP III		
	T <sub>1</sub>	T <sub>2</sub>	T <sub>3</sub>	T <sub>1</sub>	T <sub>2</sub>	T <sub>3</sub>	T <sub>1</sub>	T <sub>2</sub>	T <sub>3</sub>
1. What did you think was expected of you in this experiment?									
<u>Responses</u>									
Blank	6	4	1	2	4	6	2	7	9
Uncertain	4	4		2	7	4	7	2	5
Predict				4	3		5	2	5
Follow Sequence								4	5
Learn Pattern					1	1	6	8	7
Press Buttons	10	18	23	6	5	7	3	2	1
Learn Probability							1	1	3
Memory Test						1	2	1	
Test						1	3	1	
Guess Lights	8	7	9	16	17	11	2	2	
Think	1					3		1	
2. (a) Did the pattern of the lights--that is, the way in which they came on--remain the same throughout the experiment?									
Blank	30	16	27	4	2	10		5	
Yes	2	4	1	17	14	10	4	4	11
No		11	5	9	20	14	30	24	25



TABLE XXI (continued)

QUESTION:	GROUP I			GROUP II			GROUP III		
	T <sub>1</sub>	T <sub>2</sub>	T <sub>3</sub>	T <sub>1</sub>	T <sub>2</sub>	T <sub>3</sub>	T <sub>1</sub>	T <sub>2</sub>	T <sub>3</sub>
2.(b) If not, how did it change, and could you estimate how many different patterns were employed?									
No reply	32	26	33					10	
Changed (mean number of patterns)		4		3	4	3			4
No change									1
Patterns were reversed								22	
3. Would you please estimate the relative frequency with which each of the lights came on? That is, on the basis of 100% of the experimental trials.									
Expressed as mean % or as most (M), next (N), and least (L) *									
Left	M	M	M	M	M	M	78	60	60
Middle	N	N	N	?	N	N	14	40	20
Right	L	L	L	?	M	L	8	60	30
4. (a) Did the experiment hold your interest?									
No response									
Yes	14	16	11	28	32	25	29	11	30
No	4	1	6	1	4	3	5	12	6

\* Frequency evaluations of most (M), next (N), and least (L) were used by the two younger age groups who had difficulty expressing frequencies in terms of percentages.



TABLE XXI (continued)

QUESTION:	GROUP I			GROUP II			GROUP III		
	T <sub>1</sub>	T <sub>2</sub>	T <sub>3</sub>	T <sub>1</sub>	T <sub>2</sub>	T <sub>3</sub>	T <sub>1</sub>	T <sub>2</sub>	T <sub>3</sub>
4.(b) (If <u>S</u> became bored) Could you estimate about when you first became bored and how long it lasted? _____% of total time.									
					(no response)		29	50	30
4.(c) Did you do anything deliberately to combat this boredom?									
No response							7	12	9
Yes							0	4	2
No									
5. If you had a friend who was going to play exactly this same game and if you and he were to split his profits, how would you advise him to play?									
No response									
Use pattern									
Left (% of time)							3	5	4
							5	90	13
Middle (% of time)							2	2	20
Right (% of time)							1	1	35
No advice or don't know							5		
6.(a) Did you feel that what the machine did was influenced by your actions at all?									
No response							9	12	3
Yes							18	21	28
No							30	3	33



TABLE XXI (continued)

QUESTION:	GROUP I			GROUP II			GROUP III		
	T <sub>1</sub>	T <sub>2</sub>	T <sub>3</sub>	T <sub>1</sub>	T <sub>2</sub>	T <sub>3</sub>	T <sub>1</sub>	T <sub>2</sub>	T <sub>3</sub>
6.(b) If so, in what way?									
			(no response)			(no response)			(no response)
7.(a) Have you ever participated in a study of this type before?									
No response									
Yes	1			1		1		1	
No	19	16	7	30	33	26	33	28	37
7(b) If so, when was the study run, and what did it consist of?									
No response	1			1		1			
University of Alberta, 1958								1	



## APPENDIX B

### FITTED REGRESSION LINES AND RESPONSE CURVES



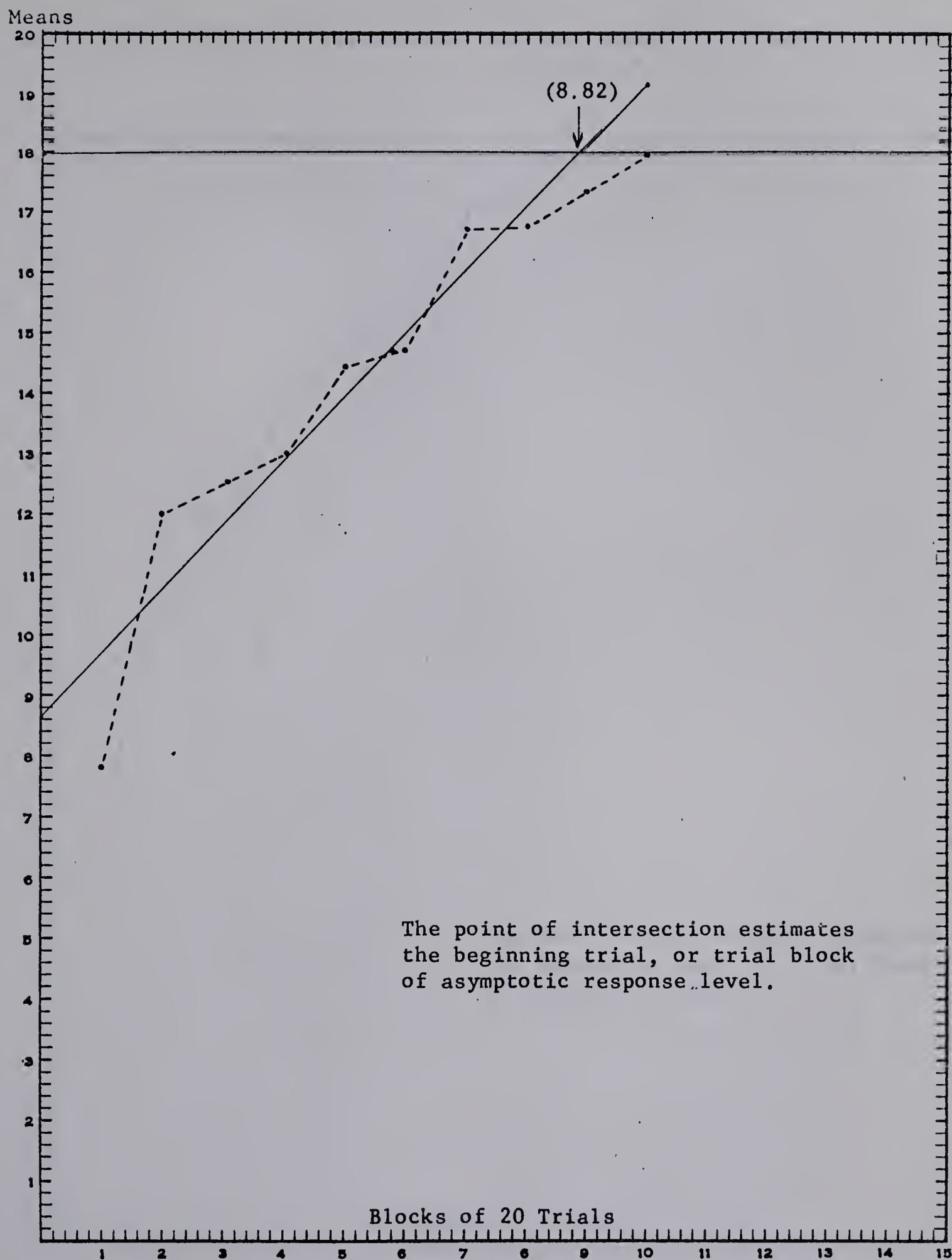


FIGURE 15

TWO REGRESSION LINES FITTED TO MFE RESPONSE CURVES FOR THE 4-6 YEAR  
AGE GROUP (M&F) UNDER TREATMENT I



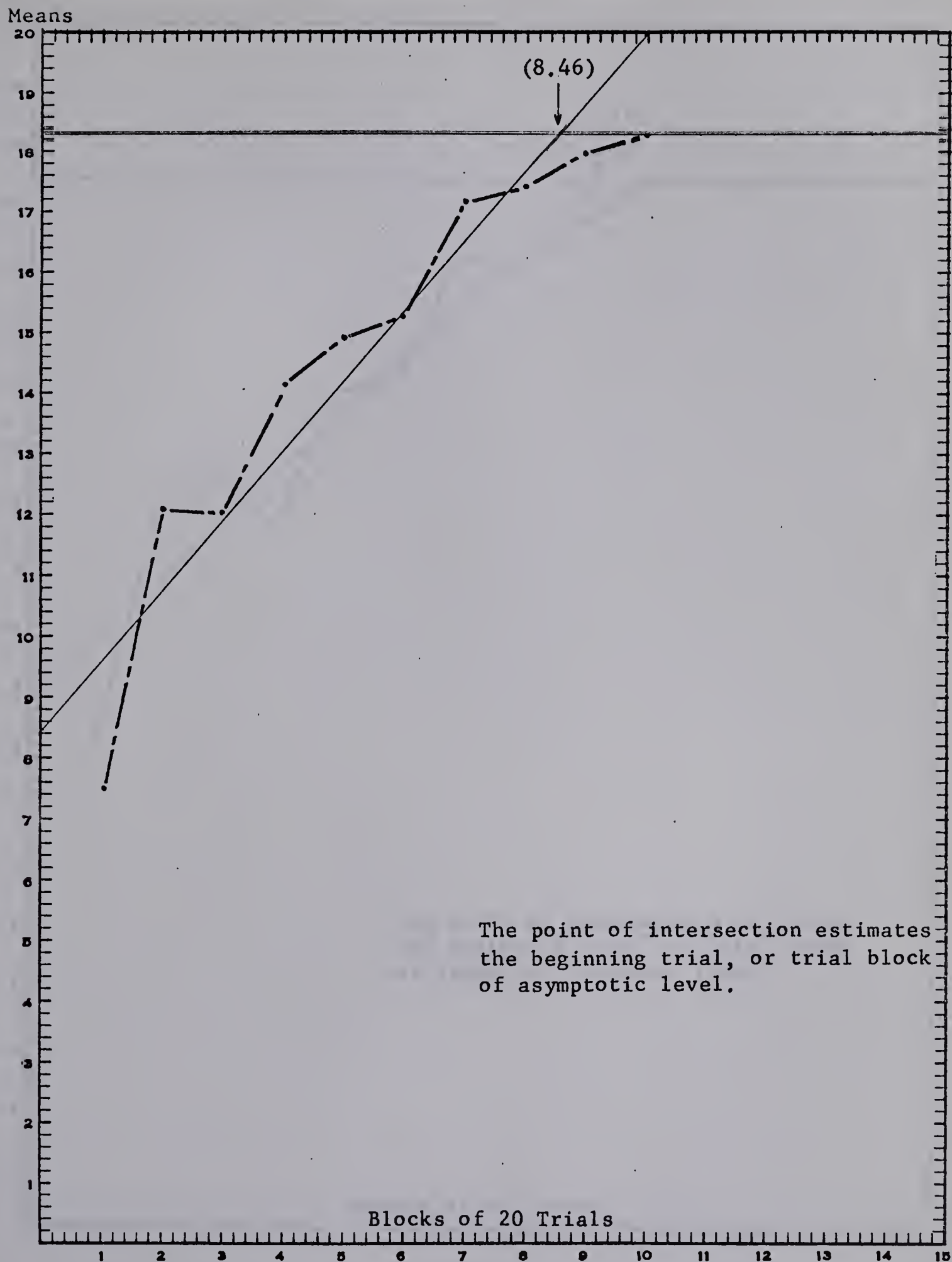


FIGURE 16

TWO REGRESSION LINES FITTED TO MFE RESPONSE CURVES FOR THE 4-6 YEAR  
AGE GROUP (MALES) UNDER TREATMENT I



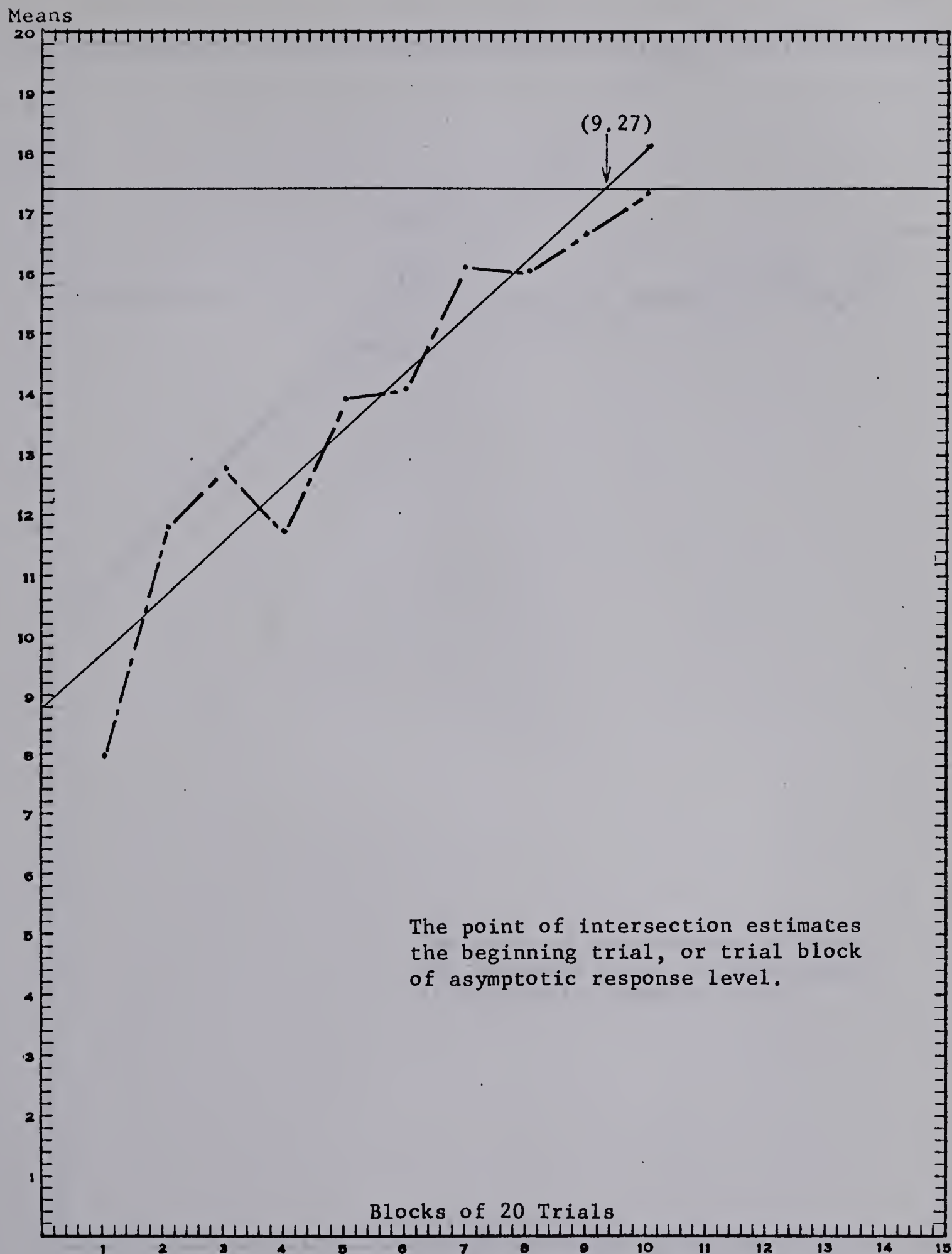


FIGURE 17

TWO REGRESSION LINES FITTED TO MFE RESPONSE CURVES FOR THE 4-6 YEAR AGE GROUP (FEMALES) UNDER TREATMENT I



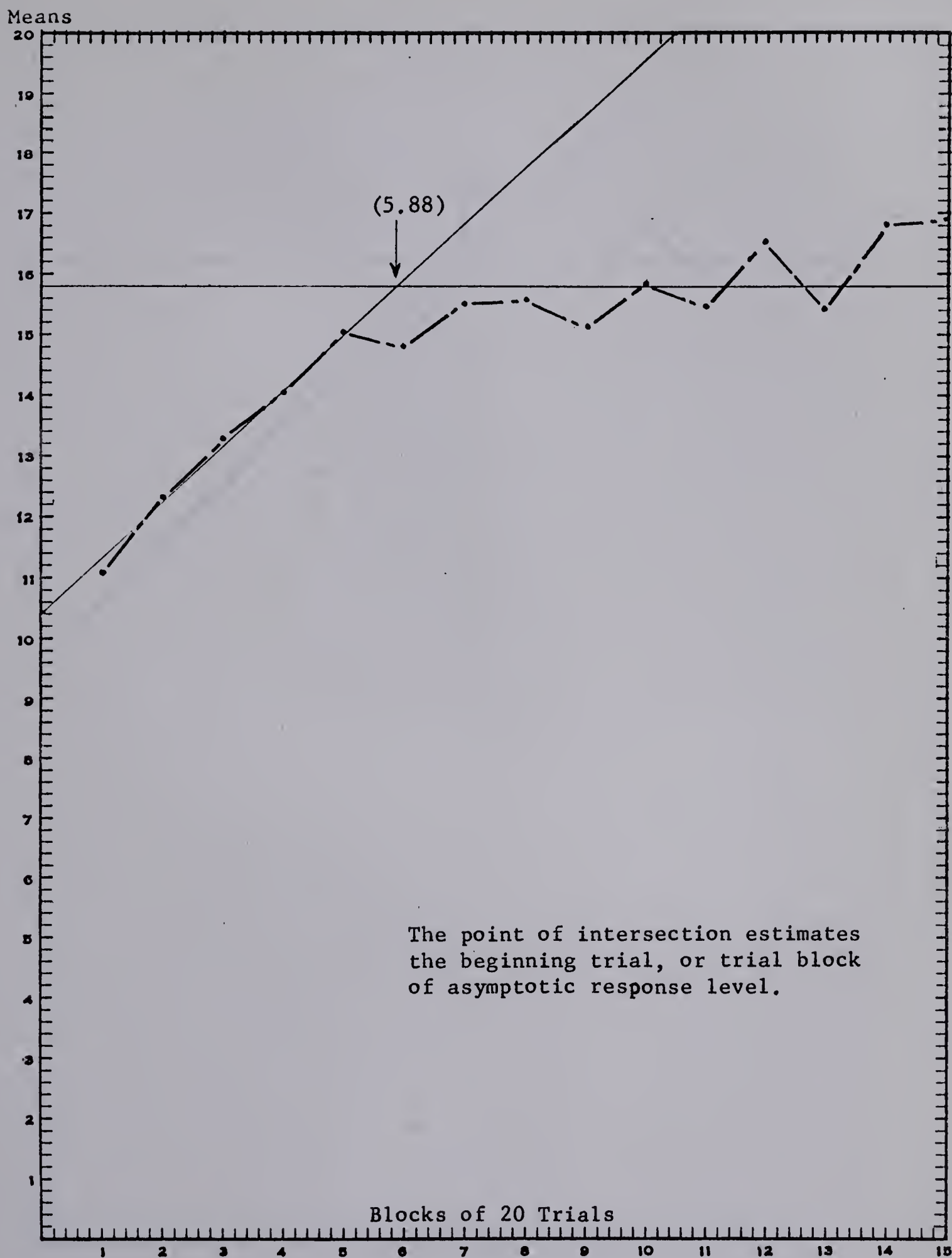


FIGURE 18

TWO REGRESSION LINES FITTED TO MFE RESPONSE CURVES FOR THE 7-10 YEAR  
AGE GROUP (M&F) UNDER TREATMENT I



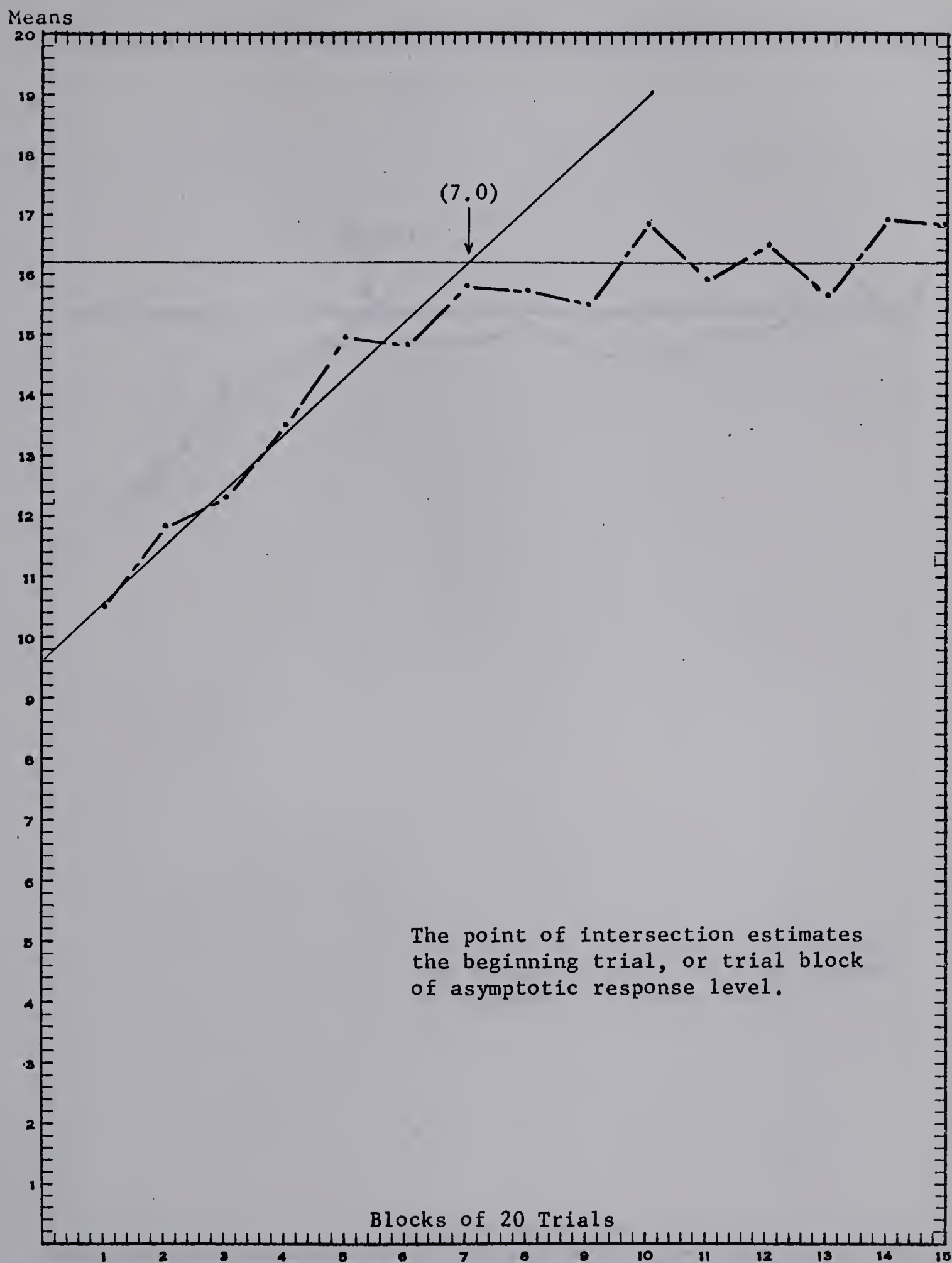


FIGURE 19

TWO REGRESSION LINES FITTED TO MFE RESPONSE CURVES FOR THE 7-10 YEAR AGE GROUP (MALES) UNDER TREATMENT I



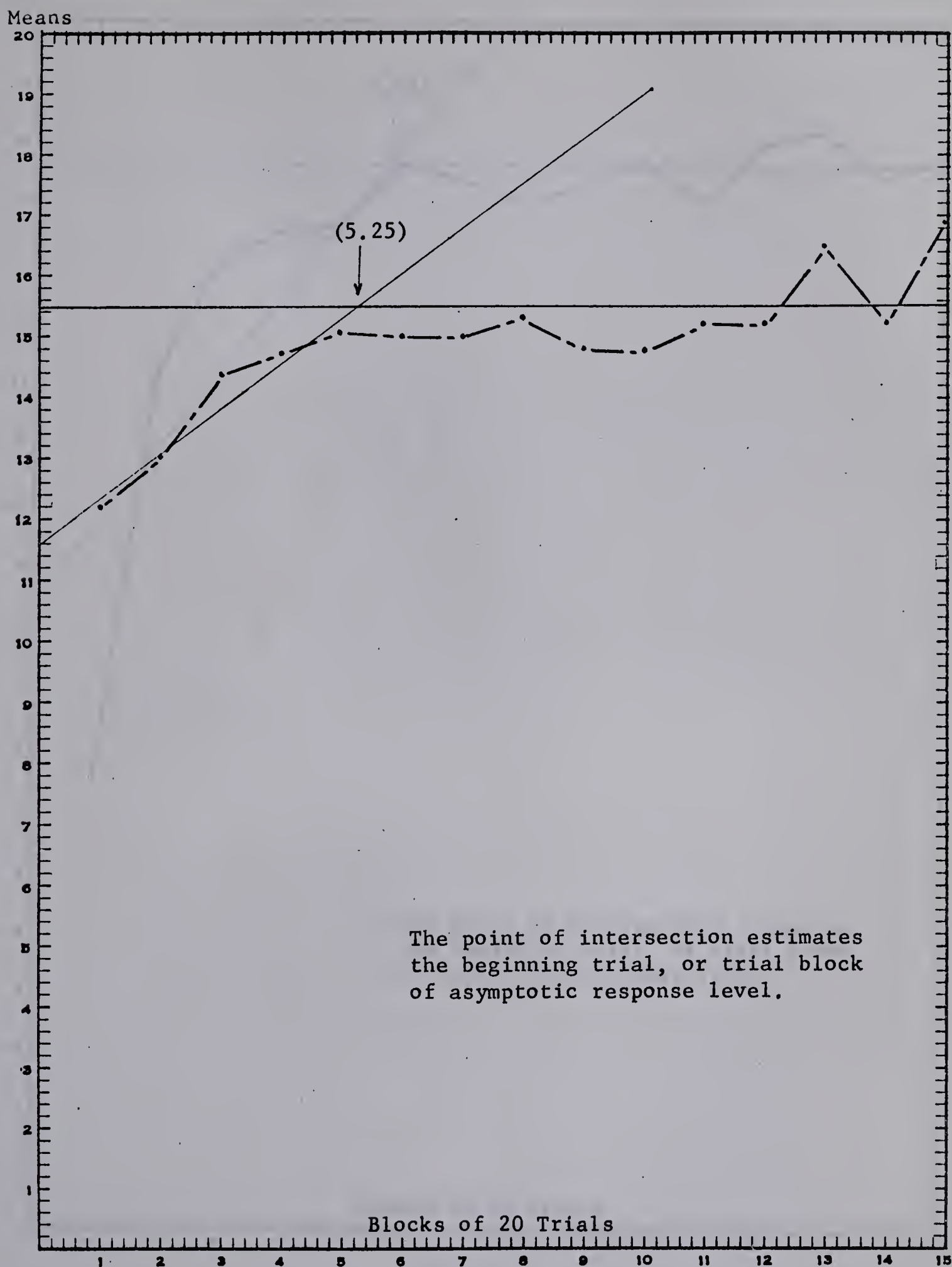


FIGURE 20

TWO REGRESSION LINES FITTED TO MFE RESPONSE CURVES FOR THE 7-10 YEAR AGE GROUP (FEMALES) UNDER TREATMENT I



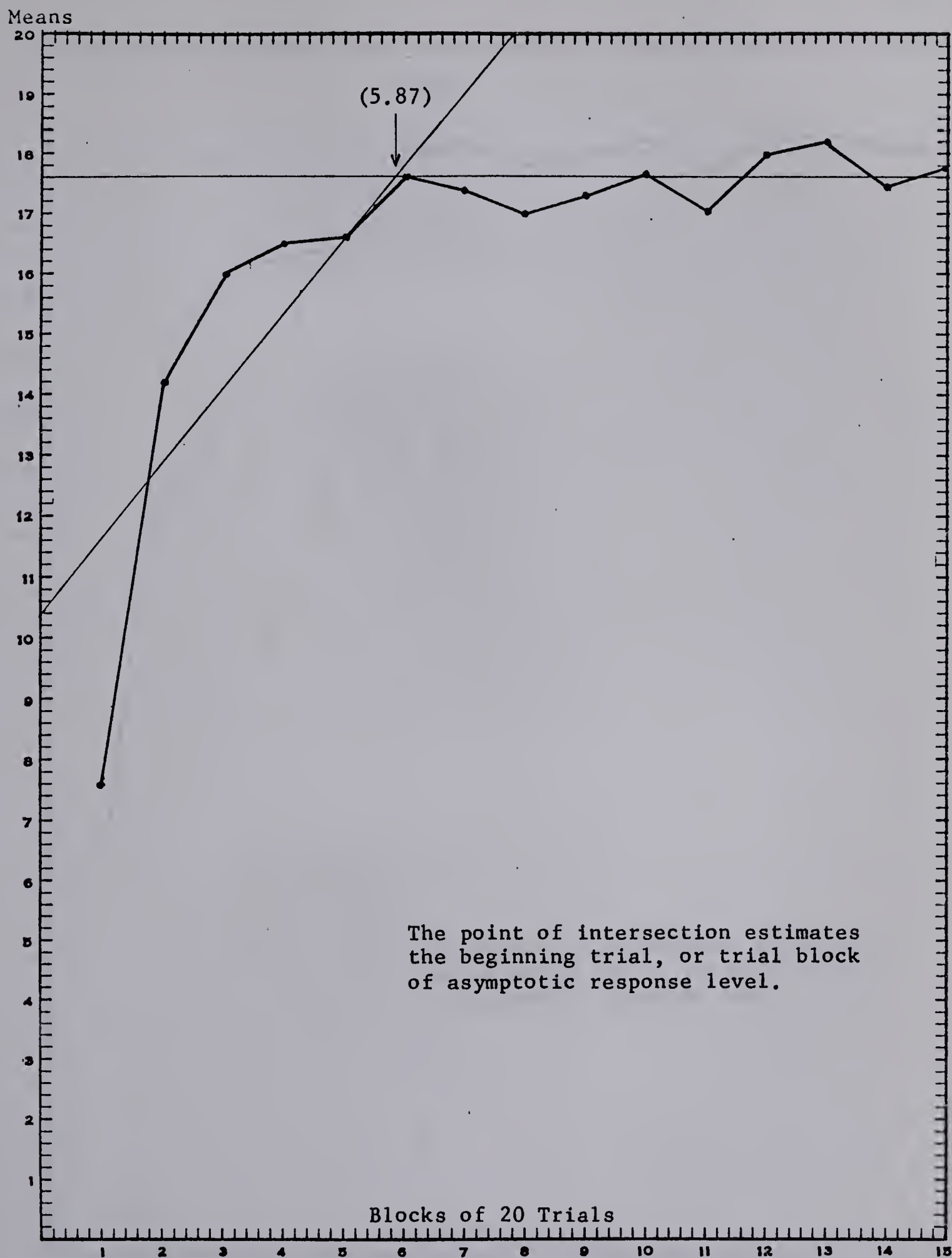


FIGURE 21

TWO REGRESSION LINES FITTED TO MFE RESPONSE CURVES FOR THE ADULT GROUP  
(M&F) UNDER TREATMENT I



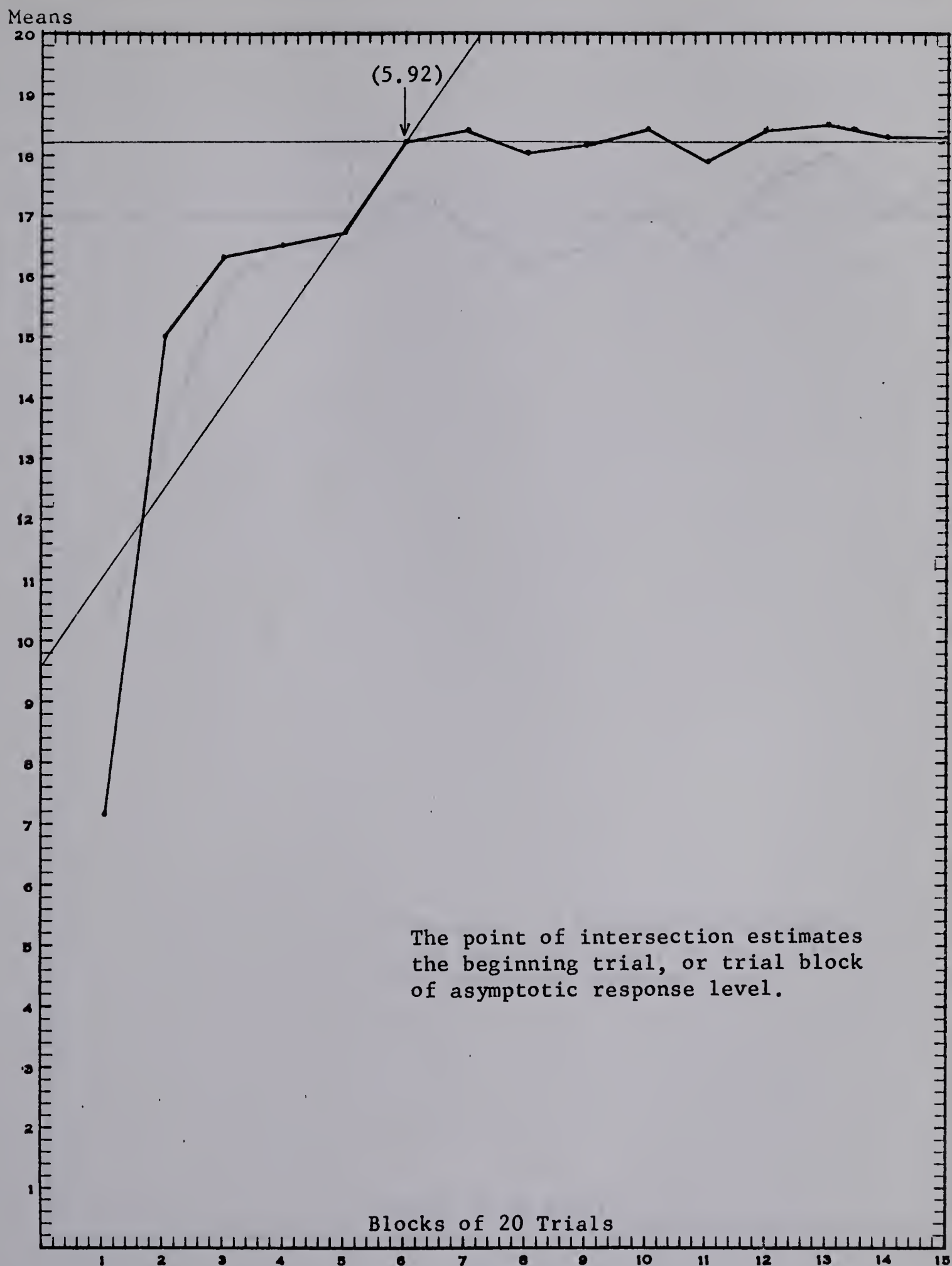


FIGURE 22

TWO REGRESSION LINES FITTED TO MFE RESPONSE CURVES FOR THE ADULT GROUP  
(MALES) UNDER TREATMENT I



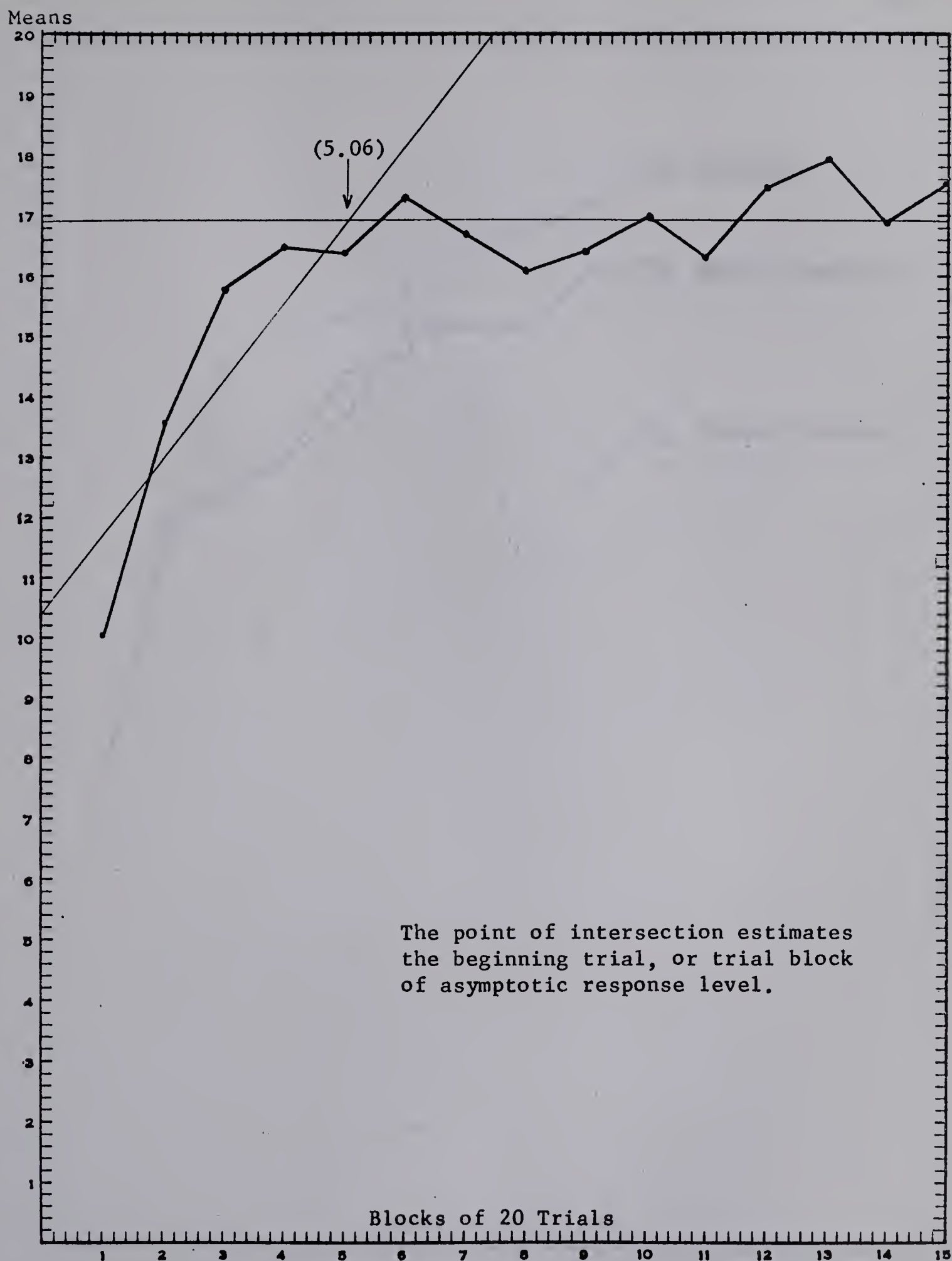


FIGURE 23

TWO REGRESSION LINES FITTED TO MFE RESPONSE CURVES FOR THE ADULT GROUP  
(FEMALES) UNDER TREATMENT I



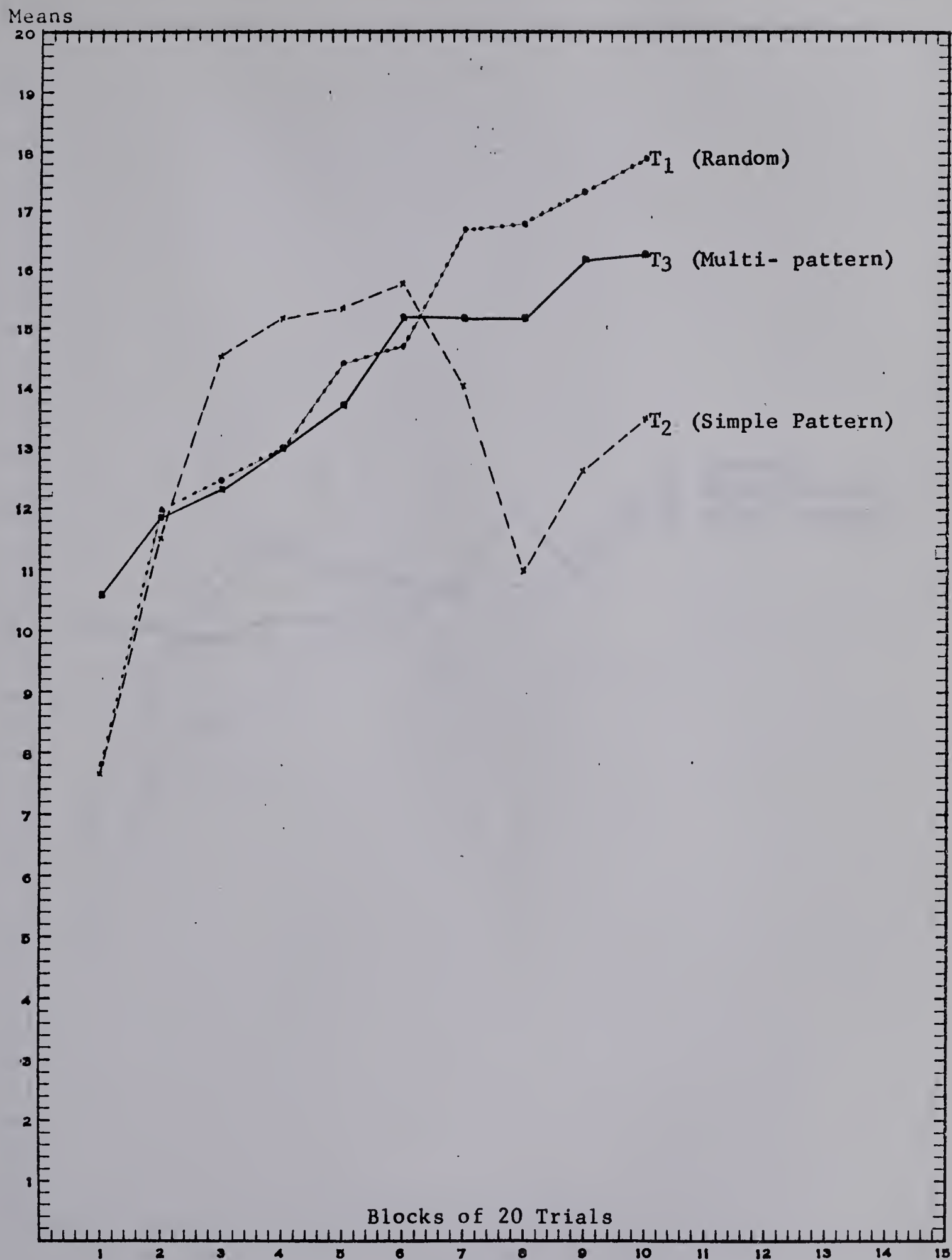


FIGURE 24

MFE RESPONSE CURVES FOR THE 4-6 YEAR AGE GROUP (M&F) UNDER EACH OF THE THREE TREATMENTS



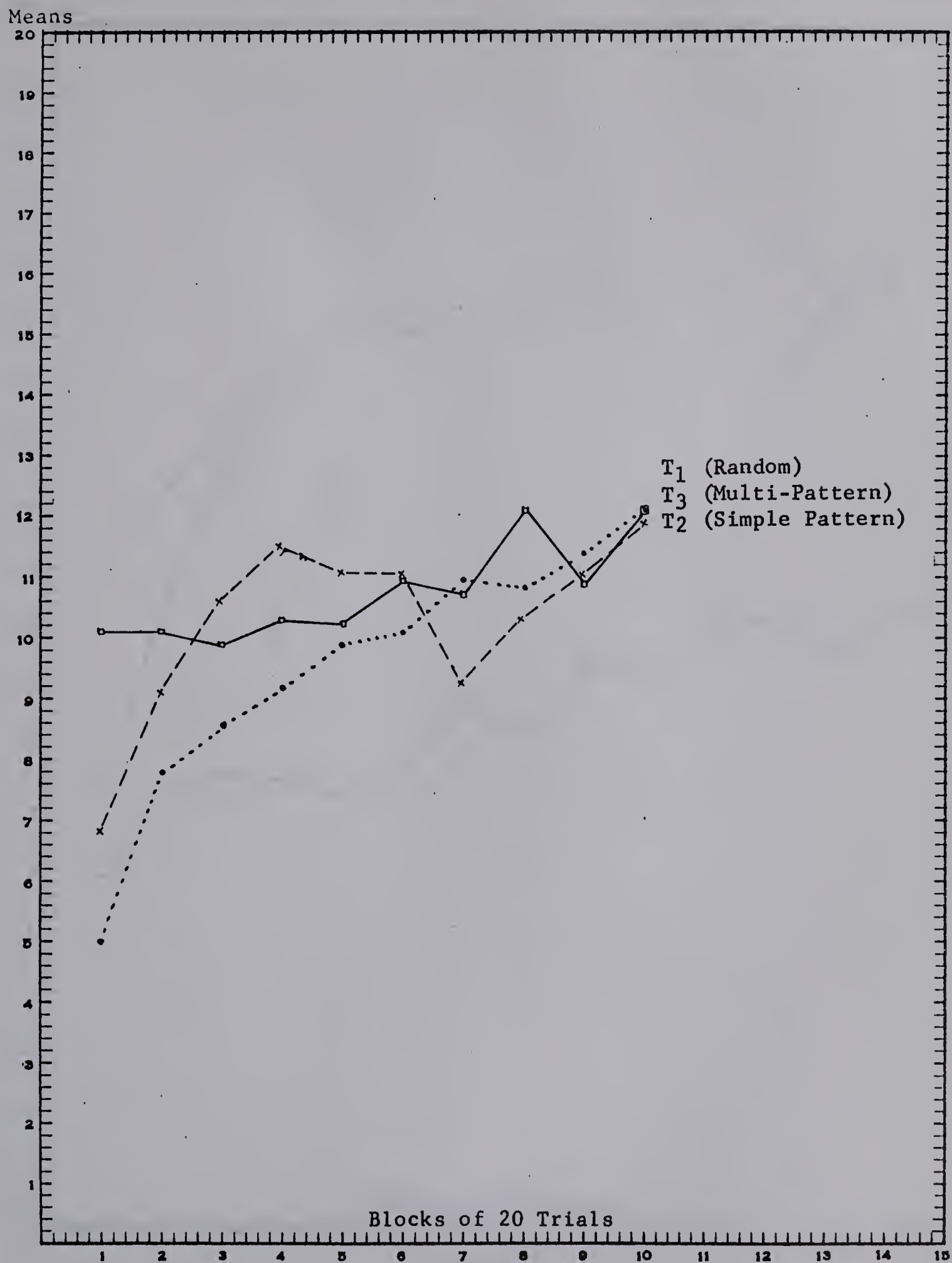


FIGURE 25

CR CURVES FOR THE 4-6 YEAR AGE GROUP (M&F) UNDER EACH OF  
THE THREE TREATMENTS



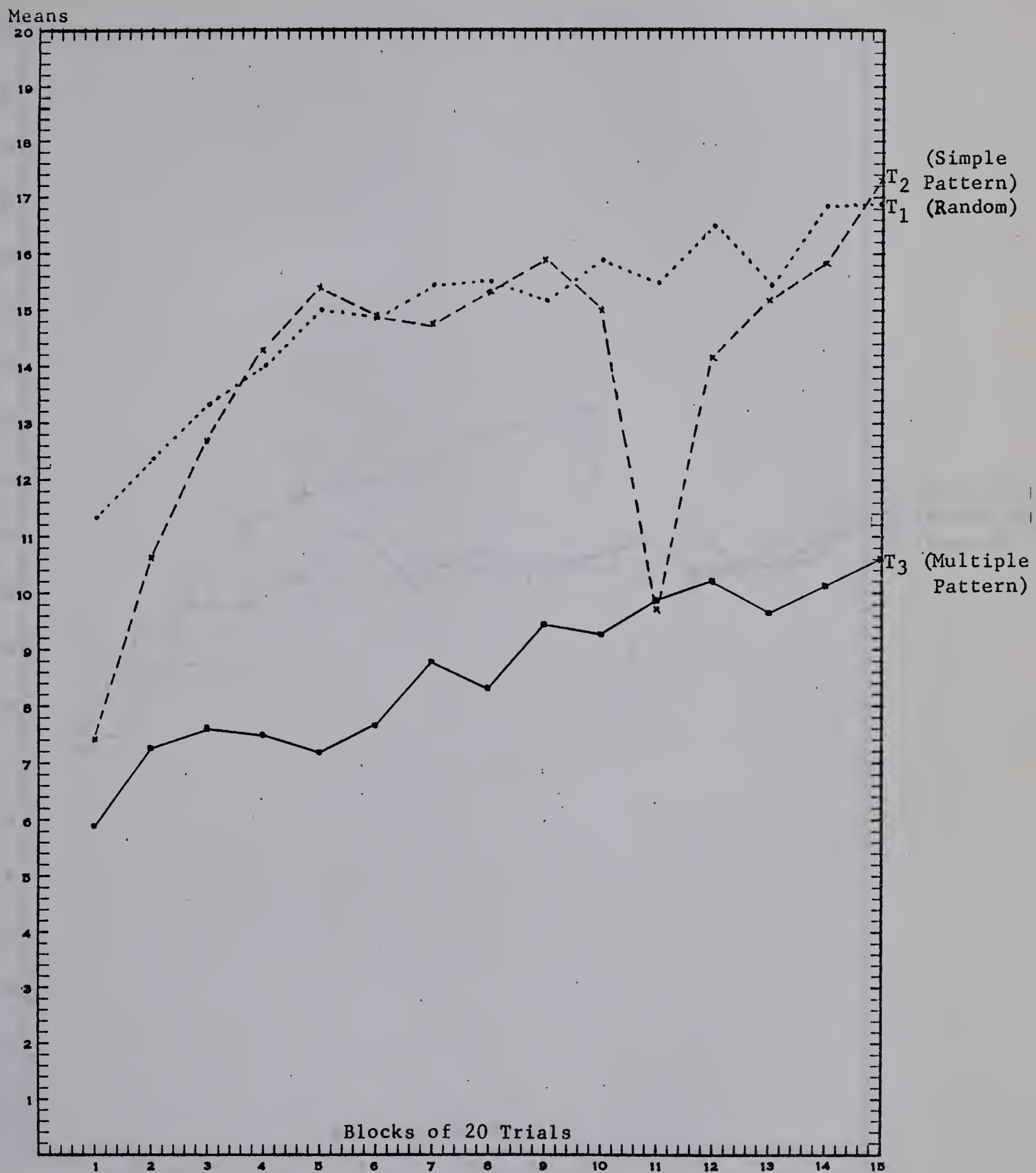


FIGURE 26

MFE RESPONSE CURVES FOR THE 7-10 YEAR AGE GROUP (M&F) UNDER EACH OF THE THREE TREATMENTS



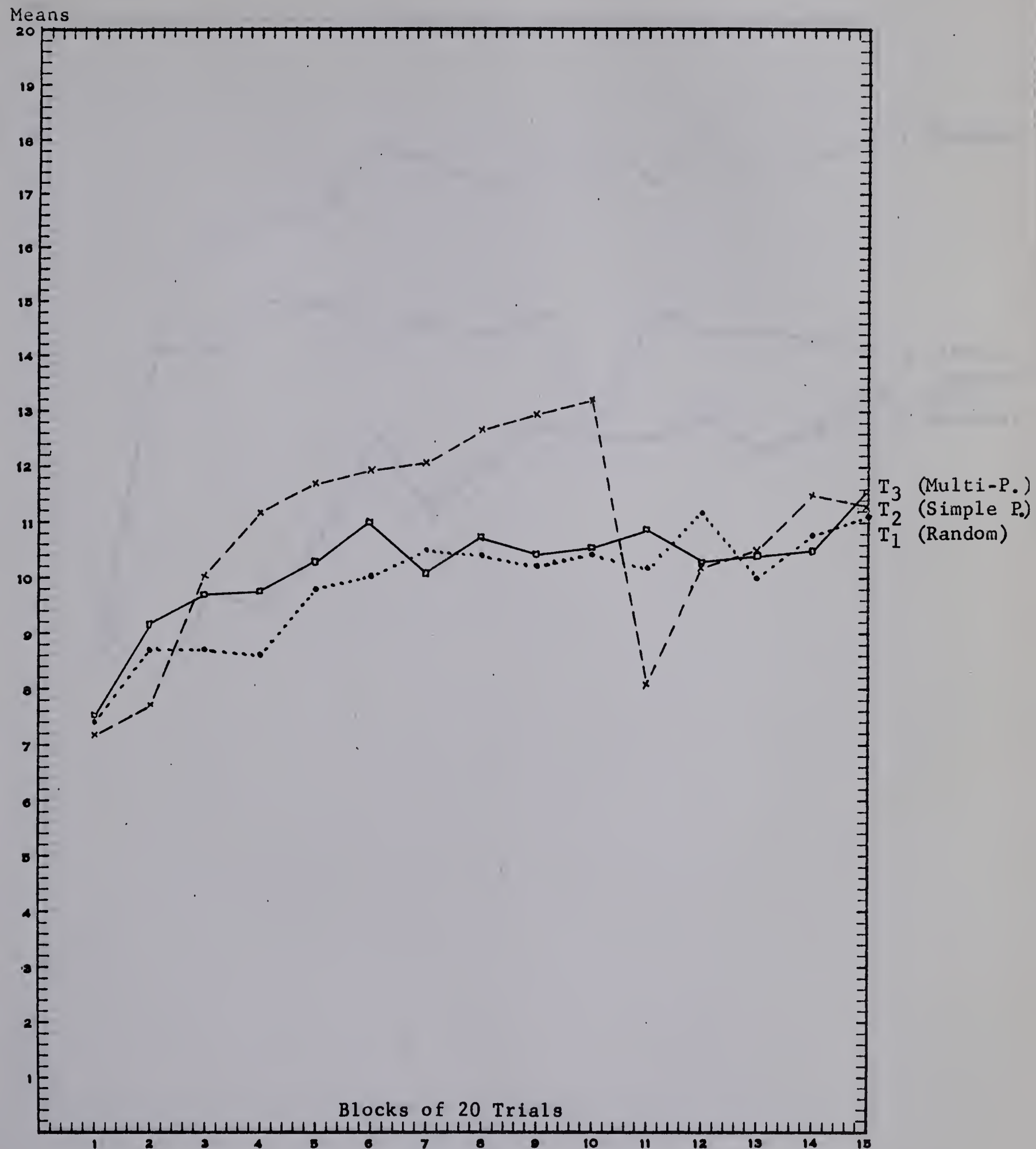


FIGURE 27

CR CURVES FOR THE 7-10 YEAR AGE GROUP (M&F) UNDER EACH OF THE THREE TREATMENTS



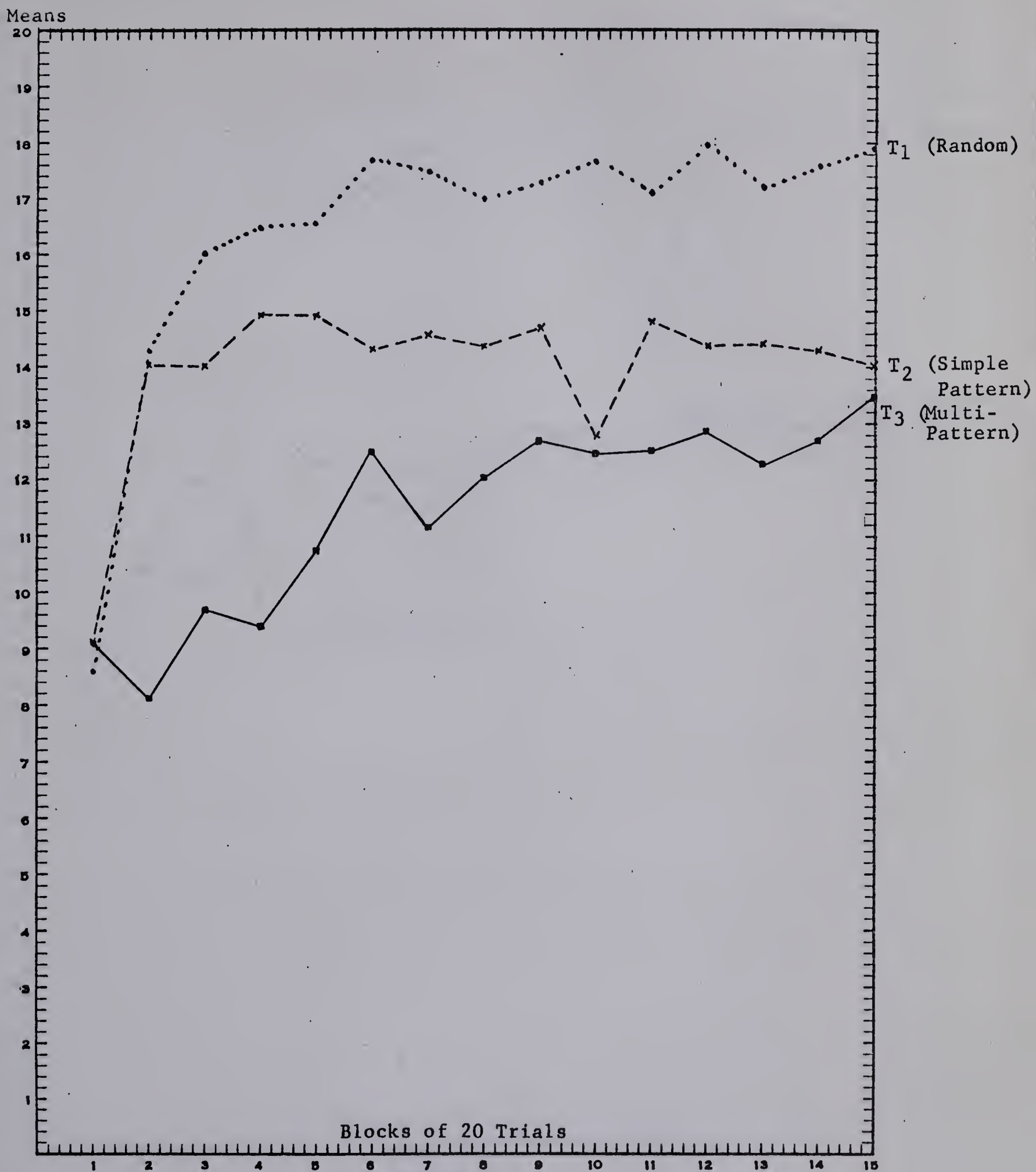


FIGURE 28

MFE RESPONSE CURVES FOR THE ADULT AGE GROUP (M&F) UNDER EACH OF THE THREE TREATMENTS



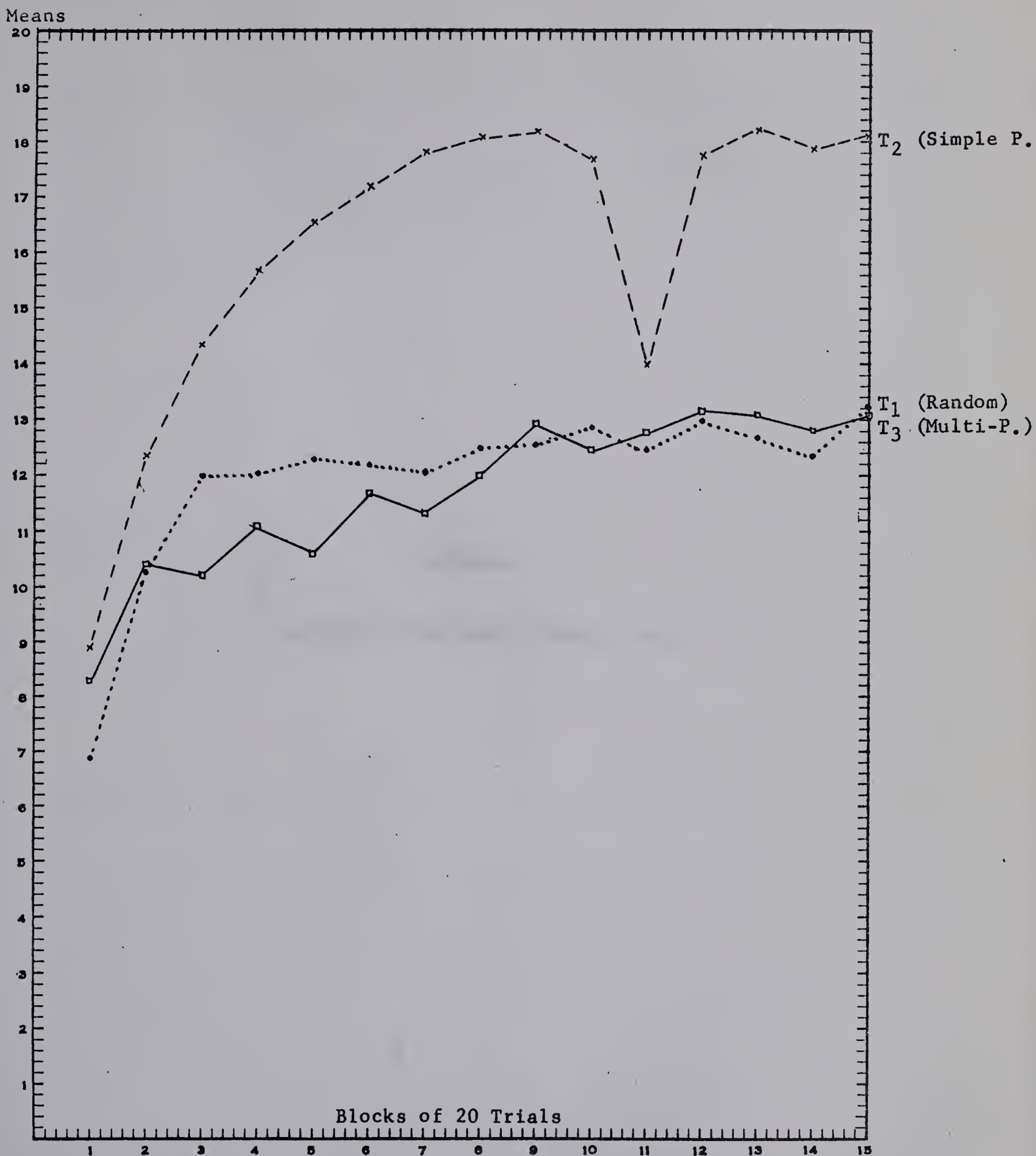


FIGURE 29

CR CURVES FOR THE ADULT AGE GROUP (M&F) UNDER EACH OF THE THREE TREATMENTS



## APPENDIX C

### ANALYSIS OF VARIANCE SUMMARY TABLES



TABLE XXII

SUMMARY OF THE THREE-FACTOR ANALYSES OF VARIANCE WITH TRIALS  
AS REPEATED MEASURE\*

Kind of Grouping	Dependent Variable	(levels)	(levels)	(repeated measures)	Where summarized *
		Age	Sex	Trials	Table
Treatment I**	MFE	3	2	10	IV
Treatment II	MFE	3	2	7	VIII
Treatment III	MFE	3	2	10	XI
		Treatment	Sex	Trials	
Age group I	MFE	3	2	10	XIV
Age group II	MFE	3	2	15	XVI
Age group III	MFE	3	2	15	XVIII
		Age	Sex	Trials	
Treatment I	CR	3	2	10	VI
Treatment II	CR	3	2	7	IX
Treatment III	CR	3	2	10	XIII
		Treatment	Sex	Trials	
Age group I	CR	3	2	10	XV
Age group II	CR	3	2	15	XVII
Age group III	CR	3	2	15	XIX
		Age	Sex	Trials	
Treatment I	MFE	3	2	5	V
Treatment III	MFE	3	2	5	XII

\* Summaries of these analyses may be found as indicated.

\*\* Special assumption - 200 trials sufficient to reach stable state.



## APPENDIX D

### SCHEMATIC AND BLOCK DIAGRAMS OF APPARATUS



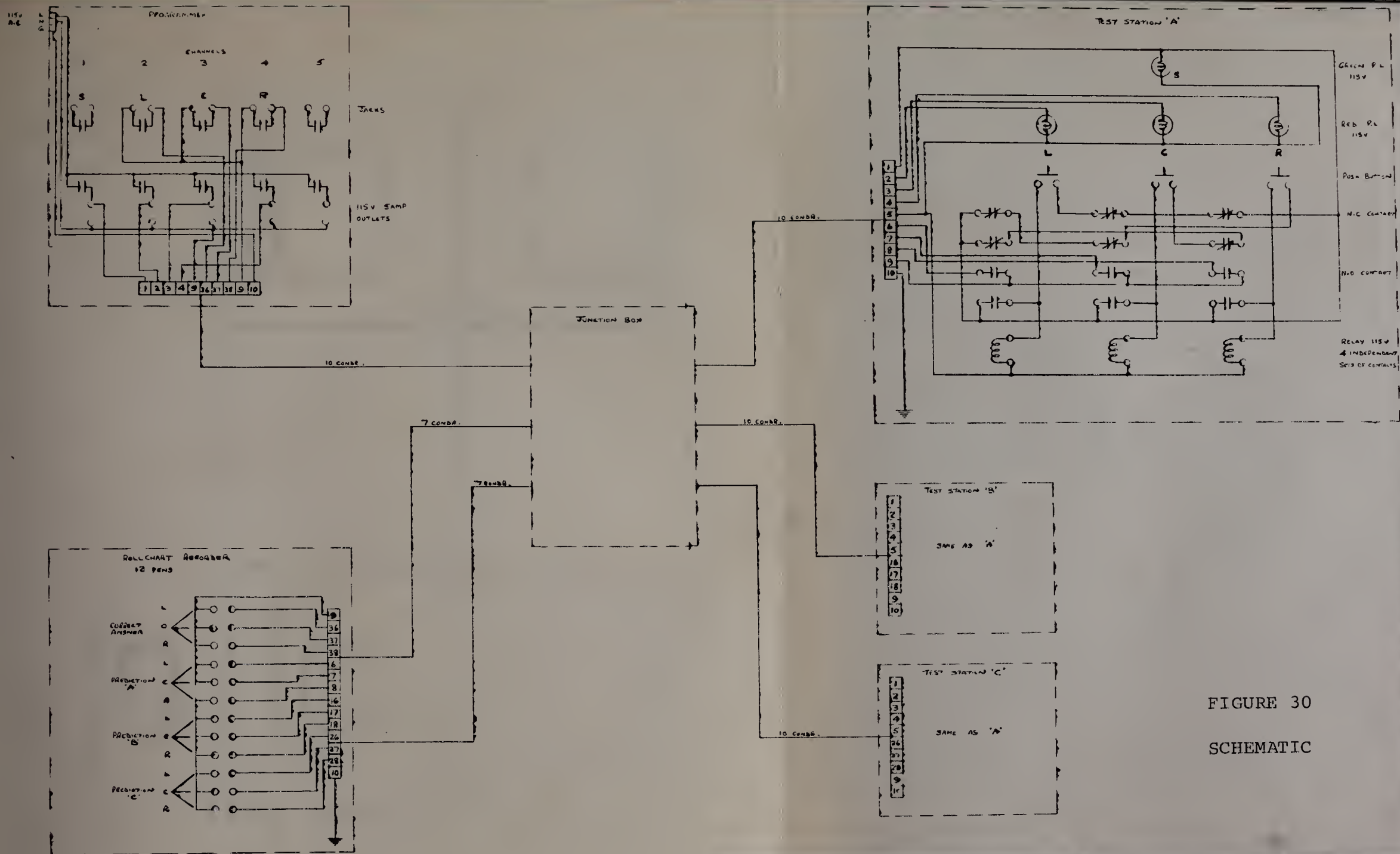


FIGURE 30  
SCHEMATIC

DIAGRAM OF CONNECTIONS  
RESEARCH EQUIPMENT P.L. P.G. STUTZ

DATE: JUN 27, 1949  
DRAWN: D.R.  
CHECK: APPR.  
SCALE:  
DWG. No. 001



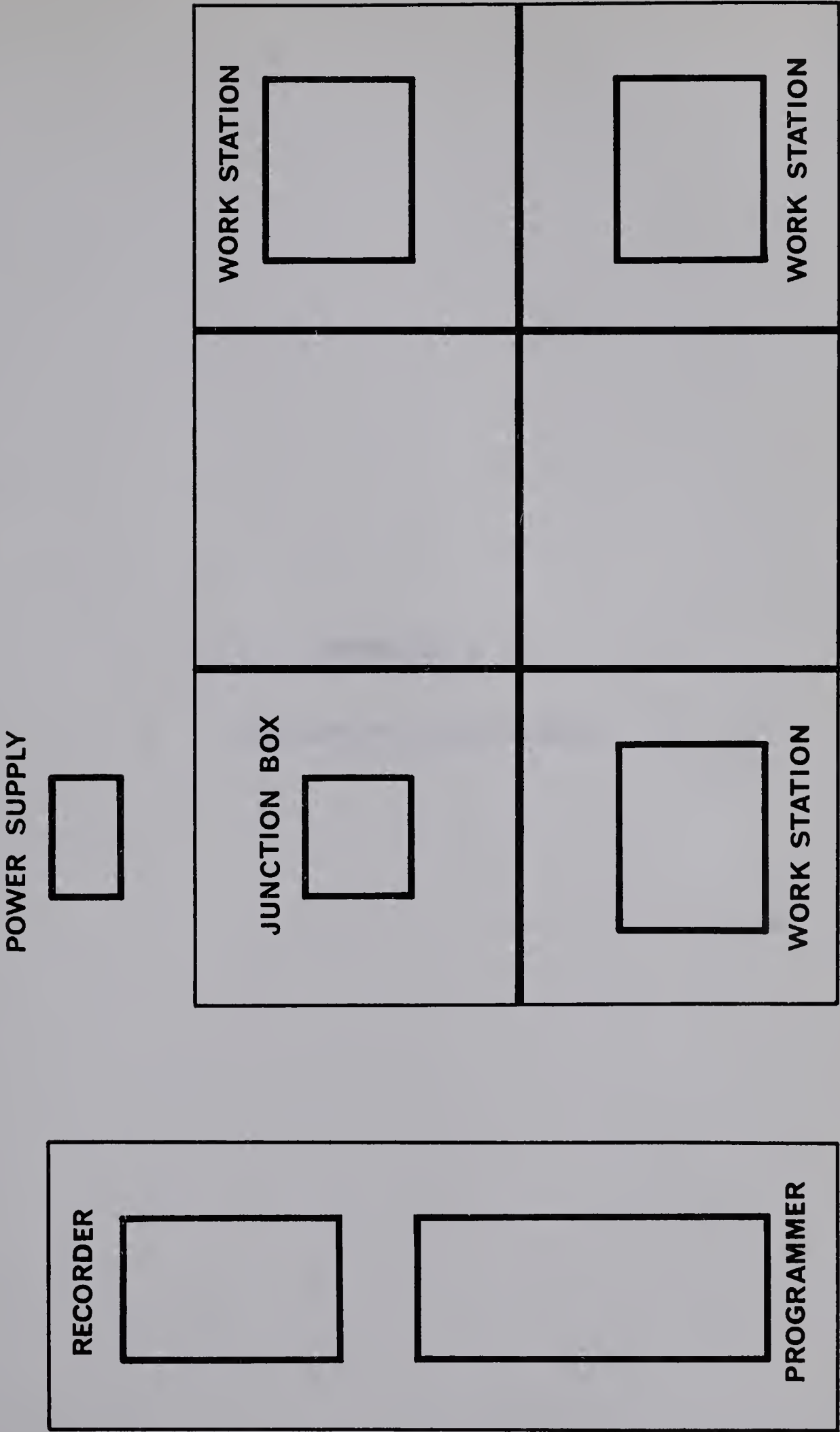


FIGURE 31  
BLOCK DIAGRAM OF APPARATUS



APPENDIX E

RAW DATA FOR ALL SUBJECTS



(RESPONSE FREQUENCIES FOR ALL EVENTS)



## BLOCKS OF 20 TRIALS

EVENT	1	2	3	4	5	6	7	8	9	10	GRP	SEX	TRT	AGE	SUBJ.
L	6	3	0	1	0	0	0	0	0	0	1	1	1	5	14
M	6	5	4	1	1	1	1	0	0	0					
R	8	12	16	18	19	19	19	20	20	20					
L	4	2	1	2	2	2	0	2	2	1	1	1	1	5	61
M	4	5	6	7	7	8	5	6	7	8					
R	12	13	13	11	11	10	15	12	11	11					
L	3	1	2	0	1	2	1	1	1	1	1	1	1	4	68
M	6	3	3	3	5	5	5	4	2	2					
R	11	16	15	17	14	13	14	15	17	18					
L	8	3	3	3	3	1	3	3	0	0	1	1	1	6	77
M	4	7	6	2	2	5	5	3	2	1					
R	8	10	11	15	15	14	12	14	18	19					
L	8	5	6	7	7	5	1	0	0	0	1	1	1	5	179
M	4	11	7	6	8	4	1	0	0	0					
R	8	4	7	7	5	11	18	20	20	20					
L	0	0	0	0	0	0	0	0	0	0	1	1	1	6	181
M	0	0	0	0	0	0	0	0	0	0					
R	20	20	20	20	20	20	20	20	20	20					
L	2	0	0	1	1	1	0	0	0	0	1	1	1	6	182
M	5	3	0	0	3	2	2	3	0	1					
R	13	17	20	19	16	17	18	17	20	19					
L	8	6	7	5	3	2	2	0	2	2	1	1	1	6	184
M	6	7	6	6	6	3	4	2	4	4					
R	6	7	7	9	11	15	14	18	14	14					
L	4	5	4	4	4	5	0	0	2	0	1	1	1	5	189
M	6	6	5	6	6	4	0	0	2	0					
R	4	9	5	10	10	11	20	20	16	20					

TABLE E 1 - RAW DATA FOR GROUP 1 UNDER TREATMENT 1 - MALES (CONTINUED)



## BLOCKS OF 20 TRIALS

EVENT 1 2 3 4 5 6 7 8 9 10 GRP SEX TRT AGE SUBJ.

L 5 6 3 1 0 0 0 0 0 0 1 1 1 5 190  
M 7 4 9 2 0 2 0 0 0 0 0 0 0 0 0

R 4 10 8 17 20 18 20 20 20 20 20

L 5 0 0 0 0 0 0 0 0 0 1 1 1 5 194

M 5 0 0 0 0 0 0 0 0 0 0 0 0 0 0

R 3 20 20 20 20 20 20 20 20 20 20 20 20 20 20

L 6 4 3 1 0 0 0 0 0 0 1 1 1 6 195

M 3 3 5 5 2 0 0 0 0 0 0 0 0 0 0

R 5 13 12 14 18 20 20 20 20 20 20 20 20 20 20

L 7 6 2 3 0 0 0 0 0 0 1 1 1 4 197

M 5 2 7 1 0 1 0 1 0 0 0 0 0 0 0

R 2 12 11 16 20 19 20 19 20 20 20 20 20 20 20

L 4 4 8 9 8 5 4 2 2 2 1 1 1 6 198

M 6 7 4 2 3 4 3 5 3 4 4 4 4 4 4

R 5 9 8 9 9 10 12 11 15 14 14 14 14 14 14

L 2 5 6 4 1 0 3 2 0 0 1 1 1 5 207

M 6 5 6 6 4 1 0 2 0 0 0 0 0 0 0

R 4 10 8 10 15 12 17 16 20 20 20 20 20 20 20

## MEANS FOR MOST FREQUENT EVENT

1 2 3 4 5 6 7 8 9 10

7.5 12.1 12.1 14.1 14.9 15.3 17.3 17.5 18.1 18.3

TABLE E 1 - RAW DATA FOR GROUP 1 UNDER TREATMENT 1 - MALES



## BLOCKS OF 20 TRIALS

EVENT	1	2	3	4	5	6	7	8	9	10	GRP	SEX	TRT	AGE	SUBJ.
L	0	2	5	1	1	0	0	0	0	0	1	1	2	6	4
M	0	1	7	1	1	0	0	0	1	0					
R	0	1	8	18	17	20	20	20	19	19					
L	5	6	2	0	0	0	0	0	0	0	1	1	2	5	201
M	5	10	0	0	0	0	0	0	0	0					
R	8	4	18	20	20	20	20	20	20	20					
L	8	2	2	5	5	0	3	0	0	0	1	1	2	5	202
M	2	1	2	7	7	0	5	0	0	0					
R	10	17	16	8	8	20	12	20	20	20					
L	19	1	0	0	0	0	0	1	15	20	1	1	2	5	254
M	0	0	0	0	1	0	0	0	0	0					
R	1	19	18	20	19	20	19	19	4	0					
L	2	2	0	0	0	2	5	12	13	15	1	1	2	4	255
M	7	6	1	0	2	0	4	2	3	2					
R	11	12	19	20	18	18	11	6	4	3					
L	1	0	1	0	0	5	2	18	19	20	1	1	2	5	256
M	7	0	0	0	0	0	0	2	1	0					
R	12	20	19	20	20	15	18	0	0	0					
L	4	1	5	2	4	3	6	10	14	13	1	1	2	5	258
M	1	1	0	1	1	1	0	0	0	2					
R	15	18	15	17	15	16	14	10	6	5					
L	1	0	0	0	0	0	2	15	19	20	1	1	2	5	259
M	1	0	0	0	0	0	0	2	1	0					
R	18	20	20	20	20	20	18	3	0	0					
L	4	3	7	4	3	5	3	13	10	13	1	1	2	4	264
M	6	7	5	6	9	7	3	3	6	4					
R	2	10	8	10	8	8	14	4	4	3					

TABLE E 2 - RAW DATA FOR GROUP 1 UNDER TREATMENT 2 - MALES (CONTINUED)



## BLOCKS OF 20 TRIALS

EVENT 1 2 3 4 5 6 7 8 9 10 GRP SEX TRT AGE SUBJ.

L 2 3 2 3 2 3 7 10 10 15 1 1 2 5 267

M 1 5 6 4 8 6 4 5 7 4

R 17 12 12 13 10 11 9 5 3 1

L 4 1 0 0 0 0 3 19 19 20 1 1 2 4 268

M 3 2 0 0 0 0 0 1 0 0

R 13 17 20 20 20 20 17 0 1 0

L 7 8 2 3 1 3 3 14 11 13 1 1 2 4 269

M 6 5 1 4 6 5 4 2 6 4

R 7 5 15 13 13 12 13 4 3 3

L 3 3 2 5 4 5 4 13 12 15 1 1 2 4 274

M 5 4 8 5 5 3 4 5 4 1

R 4 7 7 10 11 8 12 2 4 4

L 4 2 8 3 4 6 8 12 11 15 1 1 2 5 276

M 4 5 0 0 0 0 0 0 3 0

R 4 3 12 17 15 14 12 8 6 5

L 3 1 1 0 0 0 2 20 20 20 1 1 2 6 278

M 3 8 2 0 0 0 1 0 0 0

R 3 5 14 19 20 20 17 0 0 0

## MEANS FOR MOST FREQUENT EVENT

1 2 3 4 5 6 7 8 9 10

8.3 11.3 14.7 18.3 15.6 16.1 15.1 10.5 11.5 13.3

TABLE E 2 - RAW DATA FOR GROUP 1 UNDER TREATMENT 2 - MALES



## BLOCKS OF 20 TRIALS

EVENT	1	2	3	4	5	6	7	8	9	10	GRP	SEX	IRT	AGE	SUBJ.
L	1	3	0	6	0	1	2	1	0	0	1	1	3	4	279
M	2	2	6	2	3	2	4	6	0	3					
R	17	15	14	12	17	17	14	13	20	17					
L	1	6	2	3	8	5	5	0	1	2	1	1	3	5	280
M	0	6	5	7	5	8	5	2	3	4					
R	1	8	13	10	7	7	10	18	16	14					
L	6	2	1	2	0	0	3	2	0	0	1	1	3	6	281
M	7	4	2	5	2	1	1	3	0	0					
R	7	14	17	13	18	19	16	15	20	20					
L	6	2	6	4	2	0	0	0	0	0	1	1	3	4	282
M	7	7	2	6	4	2	0	1	0	1					
R	7	11	5	10	14	18	20	19	20	19					
L	8	4	5	1	0	0	0	0	0	0	1	1	3	4	283
M	4	4	7	2	2	0	0	0	0	0					
R	8	12	8	17	18	20	20	20	20	20					
L	3	2	3	1	3	0	0	2	0	0	1	1	3	7	287
M	4	1	3	2	2	0	1	0	0	0					
R	13	17	14	17	15	20	19	18	19	20					
L	7	5	7	8	10	3	0	0	0	0	1	1	3	5	288
M	8	11	8	8	5	5	4	2	2	0					
R	5	4	5	4	5	12	16	18	15	20					
L	5	2	1	0	0	0	0	0	0	0	1	1	3	4	291
M	2	2	1	0	0	0	0	0	0	0					
R	13	16	18	20	20	20	20	20	20	20					
L	6	8	3	1	0	1	1	0	0	0	1	1	3	5	292
M	5	1	0	0	0	0	0	0	0	0					
R	9	11	17	19	20	19	19	20	20	20					

TABLE E 3 - RAW DATA FOR GROUP 1 UNDER TREATMENT 3 - MALES (CONTINUED)



BLOCKS OF 20 TRIALS

EVENT 1 2 3 4 5 6 7 8 9 10 GRP SEX TRT AGE SUBJ.

L 7 5 4 0 0 0 1 4 5 6 1 1 3 5 293  
M 3 5 2 0 0 0 1 2 4 2  
R 10 10 14 20 20 20 18 14 11 12

L 4 1 2 1 0 0 0 0 0 2 1 1 3 5 298  
M 4 7 4 0 0 0 0 0 0 0  
R 11 12 14 19 20 20 20 20 15 13

L 3 3 1 7 9 8 7 6 6 2 1 1 3 5 301  
M 2 4 4 7 3 1 2 1 4 5  
R 15 13 15 6 8 11 11 13 10 13

L 5 4 2 1 0 0 0 0 0 0 1 1 3 4 302  
M 5 8 3 1 1 0 0 0 0 0  
R 10 8 15 18 19 20 20 20 20 20

L 1 3 6 2 2 2 0 0 0 0 1 1 3 5 303  
M 6 9 7 7 9 1 0 0 0 0  
R 6 8 7 11 9 17 20 20 20 20

L 0 1 4 9 3 4 8 2 3 3 1 1 3 3 304  
M 0 0 3 5 4 6 6 10 12 11  
R 20 19 13 6 13 10 6 7 5 6

MEANS FOR MOST FREQUENT EVENT

1 2 3 4 5 6 7 8 9 10  
10.1 11.9 12.6 13.5 14.9 16.7 16.6 17.0 16.7 16.9

TABLE E 3 - RAW DATA FOR GROUP 1 UNDER TREATMENT 3 - MALES



## BLOCKS OF 20 TRIALS

EVENT	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	GRP	SEX	TRT	AGE	SUBJ.
L	0	4	0	4	2	0	0	0	0	0	0	0	0	1	0	2	1	1	9	9
M	3	3	5	3	4	2	1	2	1	1	0	1	1	0	1					
R	17	13	6	13	14	18	19	18	19	19	20	19	19	19	19					
L	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	1	10	12
M	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0					
R	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20				
L	3	6	3	4	4	3	3	3	3	3	2	3	6	4	5	2	1	1	8	13
M	10	4	9	9	6	7	7	8	9	7	8	8	6	6	7					
R	7	10	8	7	10	10	10	9	8	10	10	9	8	10	8					
L	6	7	6	5	7	7	3	7	4	5	4	4	4	4	2	2	1	1	8	49
M	5	7	4	7	7	7	4	5	8	3	6	3	6	2	4					
R	9	6	10	8	6	6	8	8	9	12	10	13	10	14	14					
L	5	3	3	5	1	1	9	0	4	5	7	1	3	2	3	2	1	1	7	53
M	6	3	9	7	5	5	1	6	4	3	3	5	6	5	5					
R	9	14	8	8	14	14	10	14	12	12	10	14	11	13	12					
L	5	7	4	4	3	3	2	2	1	1	0	0	0	0	1	2	1	1	8	54
M	6	8	5	2	0	3	2	1	2	0	0	0	0	0	0					
R	9	5	11	14	17	14	16	17	17	19	20	20	20	20	19					
L	4	4	6	3	5	1	3	6	8	4	7	5	4	3	1	2	1	1	7	64
M	8	13	9	13	11	11	4	6	7	2	10	10	10	7	10					
R	8	3	5	4	4	8	13	8	5	14	3	5	6	10	9					
L	3	1	1	2	1	1	0	0	0	0	0	0	0	0	0	2	1	1	8	65
M	7	4	4	3	3	0	0	0	0	0	0	0	0	0	0					
R	10	15	15	15	16	19	20	20	20	20	20	20	20	20	20	20				
L	6	2	4	4	2	5	2	1	2	4	4	5	2	2	1	2	1	1	8	66
M	7	7	5	4	3	2	2	4	5	3	1	4	4	4	4					
R	7	11	11	12	15	13	16	15	13	13	15	11	14	14	15					

TABLE E 4 - RAW DATA FOR GROUP 2 UNDER TREATMENT 1 - MALES (CONTINUED)



## BLOCKS OF 20 TRIALS

EVENT 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 GRP SEX TRT AGE SUBJ.

L	9	1	3	3	2	1	1	0	2	0	0	0	0	0	0	2	1	1	11	67
M	3	5	3	2	1	3	3	0	0	0	0	3	1	0						
R	8	14	14	15	17	16	17	20	18	20	20	17	19	20						

L	2	0	0	0	1	0	0	0	0	1	0	0	0	0	0	2	1	1	10	71
M	6	0	1	0	0	2	2	3	0	1	4	0	6	0	0					
R	12	20	19	20	20	17	18	17	20	19	15	20	14	20	20					

L	6	6	4	4	4	2	2	2	2	0	1	0	0	0	0	2	1	1	7	72
M	5	6	5	4	5	5	4	5	5	4	4	3	3	1						
R	9	8	11	12	11	13	14	13	13	16	15	17	17	19						

L	4	2	2	2	0	0	0	0	0	0	0	0	0	0	0	2	1	1	9	73
M	7	2	3	0	0	1	1	0	0	0	0	0	0	0	0					
R	9	16	15	18	20	19	19	20	20	20	20	20	20	20	20					

L	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	1	8	74
M	5	4	0	0	0	0	2	0	0	0	0	0	0	0	0					
R	14	14	20	20	20	20	18	20	20	20	20	20	20	20	20					

L	5	4	1	0	0	1	0	1	1	0	0	0	1	0	0	2	1	1	7	75
M	6	9	7	5	0	3	0	2	0	0	0	0	2	1						
R	9	7	12	15	20	16	20	17	19	20	20	20	17	19						

## MEANS FOR MOST FREQUENT EVENT

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
10.5	11.7	12.3	13.4	14.9	14.9	15.9	15.7	15.5	16.9	15.9	16.5	15.7	16.9	16.9

TABLE E 4 - RAW DATA FOR GROUP 2 UNDER TREATMENT 1 - MALES



## BLOCKS OF 20 TRIALS

EVENT	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	GRP	SEX	TRT	AGE	SUBJ.
L	7	7	3	4	1	0	1	0	0	0	5	12	16	20	20	2	1	2	8	1
M	5	7	5	3	3	3	1	0	0	0	1	3	2	0	0					
R	6	6	8	13	16	17	18	20	20	20	14	5	2	0	0					
L	7	3	2	2	3	3	2	5	2	4	7	10	8	15	16	2	1	2	8	2
M	5	6	6	4	5	9	9	4	8	4	8	8	6	3	2					
R	8	11	12	14	12	8	9	11	10	12	5	6	6	2	1					
L	10	8	3	2	2	2	2	2	2	3	12	13	13	13	13	2	1	2	9	20
M	5	3	2	3	3	5	2	4	3	5	1	3	3	3	3					
R	5	9	15	15	15	13	16	14	15	12	7	4	4	4	4					
L	5	3	2	4	1	2	0	3	3	2	7	11	19	14	17	2	1	2	10	23
M	9	4	3	1	2	1	2	0	1	1	4	4	0	5	1					
R	6	13	15	15	17	17	18	17	16	17	9	5	1	1	2					
L	3	7	2	1	1	4	2	2	0	6	17	16	18	17	18	2	1	2	8	27
M	6	5	3	2	1	1	0	0	2	2	1	0	1	2	0					
R	9	8	15	17	18	15	18	18	18	8	2	4	1	1	2					
L	9	5	4	2	1	1	2	2	1	2	11	17	15	16	16	2	1	2	9	36
M	4	8	5	5	3	4	4	3	3	3	3	1	3	2	2					
R	7	7	11	13	16	15	14	15	16	15	6	2	2	2	2					
L	6	7	6	2	1	2	0	0	0	0	10	15	14	20	19	2	1	2	7	40
M	7	7	8	3	2	2	2	1	0	0	1	1	3	0	1					
R	4	6	6	15	17	16	18	19	20	20	9	4	3	0	0					
L	3	6	4	2	1	2	1	3	1	4	12	14	17	17	16	2	1	2	9	41
M	5	6	8	3	2	3	5	1	1	0	1	3	1	1	2					
R	4	8	8	15	17	15	14	16	18	16	7	3	2	2	2					
L	5	9	1	2	2	3	2	1	1	0	10	16	20	20	20	2	1	2	9	47
M	11	7	6	6	4	3	2	2	0	1	2	2	0	0	0					
R	4	4	13	12	14	14	16	17	19	19	8	2	0	0	0					

TABLE E 5 - RAW DATA FOR GROUP 2 UNDER TREATMENT 2 - MALES (CONTINUED)



## BLOCKS OF 20 TRIALS

EVENT 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 GRP SEX TRT AGE SUBJ.

L 6 5 3 4 2 4 3 4 4 3 11 12 14 14 17 2 1 2 9 56

M 2 2 2 4 4 2 4 4 4 3 5 6 4 5 1 1 1 9 56

R 12 13 15 12 14 14 13 12 12 14 4 2 2 1 2 2 1 9 56

L 7 7 3 6 6 8 5 6 5 6 12 15 19 19 20 2 1 2 9 57

M 7 7 6 3 3 1 0 0 0 0 1 1 0 0 0 2 1 2 9 57

R 6 6 11 11 11 11 15 14 15 14 7 4 1 1 0 2 1 2 9 57

L 7 1 3 4 2 2 3 1 2 0 11 13 13 12 12 2 1 2 9 58

M 0 1 0 0 0 2 1 1 2 2 5 4 4 6 6 2 1 2 9 58

R 13 18 17 16 18 16 16 18 16 18 4 3 3 2 2 2 1 2 9 58

L 5 3 1 0 1 0 1 1 1 1 8 12 15 14 19 2 1 2 8 80

M 7 7 6 4 3 1 2 1 3 3 2 2 2 2 0 2 1 2 8 80

R 7 9 13 15 16 16 5 18 16 16 10 6 3 4 1 2 1 2 8 80

L 7 6 4 2 2 1 1 1 0 0 7 9 10 13 19 2 1 2 7 85

M 6 5 1 0 0 0 0 0 0 0 1 2 5 1 0 2 1 2 7 85

R 7 8 15 18 18 19 19 19 20 20 11 9 5 6 1 2 1 2 7 85

L 9 4 3 4 2 3 2 2 2 2 8 16 17 16 18 2 1 2 9 87

M 6 3 1 0 0 0 0 0 0 0 2 0 0 0 0 2 1 2 9 87

R 4 12 14 16 18 15 18 17 18 18 10 4 2 2 2 2 1 2 9 87

## MEANS FOR MOST FREQUENT EVENT

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

6.8 9.2 12.5 14.5 15.8 14.7 15.1 16.3 16.6 15.9 9.9 13.4 15.2 16.0 17.3

TABLE E 5 - RAW DATA FOR GROUP 2 UNDER TREATMENT 2 - MALES



## BLOCKS OF 20 TRIALS

EVENT	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	GRP	SEX	TRT	AGE	SUBJ.
L	5	7	3	5	8	6	4	7	2	4	1	3	3	2	3	2	1	3	11	31
M	8	5	7	5	3	5	7	6	6	5	6	5	5	7	5					
R	7	8	10	10	9	9	9	6	12	11	13	12	12	11	12					
L	10	1	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	3	7	95
M	6	2	0	0	6	0	0	0	0	0	0	0	0	0	0					
R	1	16	20	20	13	20	20	20	20	20	20	20	20	20	20					
L	6	6	5	5	5	5	6	5	4	5	3	5	4	4	4	2	1	3	9	96
M	8	9	8	7	10	6	7	9	8	6	7	6	8	6	6					
R	5	6	6	7	4	6	8	3	8	8	10	9	7	10	10					
L	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	3	7	97
M	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0					
R	12	20	20	20	20	20	20	20	20	20	20	20	20	20	20					
L	4	1	4	7	4	3	7	7	7	7	5	5	8	5	5	2	1	3	7	104
M	4	9	8	5	7	8	6	7	6	7	8	8	5	5	7					
R	3	4	3	4	4	6	7	6	6	6	4	6	7	7	8					
L	7	7	4	5	6	7	7	7	6	7	6	6	7	8	9	2	1	3	7	105
M	7	6	9	8	8	5	6	7	6	5	5	4	8	3	4					
R	5	5	7	2	7	7	6	6	8	8	7	10	5	8	7					
L	2	4	4	4	6	7	4	4	4	4	2	3	3	2	0	2	1	3	9	239
M	2	5	5	3	4	4	6	9	6	8	10	7	7	10	9					
R	3	11	11	13	10	9	10	7	10	8	8	10	10	8	11					
L	6	7	7	7	6	6	7	5	8	7	5	4	5	5	4	2	1	3	9	240
M	4	4	5	7	7	7	8	9	7	10	8	8	9	7	10					
R	10	9	8	6	7	5	5	6	5	3	7	8	6	8	6					
L	8	7	6	7	7	6	7	9	6	7	7	6	7	7	6	2	1	3	10	242
M	6	8	8	7	7	9	5	6	7	7	7	7	4	8	6					
R	6	5	6	6	6	5	8	5	7	6	6	7	9	5	8					

TABLE E 6 - RAW DATA FOR GROUP 2 UNDER TREATMENT 3 - MALES (CONTINUED)



## BLOCKS OF 20 TRIALS

EVENT 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 GRP SEX TRT AGE SUBJ.

L 6 5 7 5 7 7 6 7 8 6 3 5 3 4 2 2 1 3 7 243

M 7 8 7 7 6 9 7 7 6 9 8 7 8 6 7 7 1 3 7 243

R 6 7 6 8 7 7 5 6 6 5 9 8 9 10 11 11 1 3 7 243

L 7 7 6 4 6 6 3 6 6 5 4 3 4 6 0 2 1 3 10 245

M 6 5 8 6 7 5 6 8 7 8 7 8 5 2 0 7 1 3 10 245

R 7 7 6 10 7 9 8 9 7 7 9 9 11 12 20 11 1 3 10 245

L 6 7 8 6 5 7 7 5 5 7 3 3 2 5 5 2 1 3 10 246

M 5 6 6 8 9 11 7 8 10 6 8 6 4 7 6 6 1 3 10 246

R 5 7 6 7 5 4 6 7 5 6 9 11 13 8 8 8 1 3 10 246

L 8 3 5 5 6 6 7 9 9 8 6 4 7 4 4 2 1 3 13 261

M 5 11 7 7 11 6 6 6 6 7 9 10 6 8 6 6 1 3 13 261

R 7 6 8 8 3 3 7 5 5 5 5 6 7 8 10 10 1 3 13 261

L 5 6 4 8 4 8 8 8 7 8 7 7 8 5 2 2 1 3 12 262

M 6 9 7 6 9 7 2 6 3 4 5 2 3 5 2 2 1 3 12 262

R 9 5 9 6 7 5 10 6 10 8 8 11 9 10 16 16 1 3 13 263

L 5 7 8 9 6 10 7 7 4 1 5 4 2 2 2 2 1 3 13 263

M 5 6 5 7 8 6 4 1 3 5 1 5 5 4 2 2 1 3 13 263

R 10 7 7 4 6 4 9 12 13 14 12 15 13 14 16 16 1 3 13 263

## MEANS FOR MOST FREQUENT EVENT

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

6.4 8.2 8.9 8.7 7.7 7.9 9.2 8.3 9.5 9.0 9.8 10.8 10.5 10.6 12.2

TABLE E 6 - RAW DATA FOR GROUP 2 UNDER TREATMENT 3 - MALES



## BLOCKS OF 20 TRIALS

EVENT	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	GRP	SEX	TRT	AGE	SUBJ.
L	7	0	0	1	1	1	0	0	1	0	1	0	1	0	0	3	1	1	23	110
M	10	1	1	0	1	1	0	0	0	0	0	1	0	1	3					
R	3	19	19	19	18	18	20	20	19	20	19	19	19	19	17					
L	5	3	8	4	2	2	1	0	0	0	2	2	2	1	3	3	1	1	21	111
M	12	5	2	1	0	1	0	3	4	1	3	0	0	2	3					
R	3	12	10	15	18	17	19	17	16	19	15	18	18	17	14					
L	9	1	2	2	1	0	0	0	0	0	0	1	0	0	0	3	1	1	26	112
M	4	4	3	3	4	0	0	1	1	2	1	0	0	0	0					
R	7	15	15	15	15	20	20	19	19	18	19	19	20	20	20					
L	7	2	1	2	2	0	1	1	2	4	1	2	0	0	0	3	1	1	22	113
M	2	2	3	3	3	1	0	1	3	0	1	1	0	1	2					
R	11	16	16	15	15	19	19	18	15	16	18	17	20	19	18					
L	3	1	1	0	0	1	0	1	0	0	0	0	0	0	0	3	1	1	29	114
M	6	2	0	1	0	0	0	0	0	0	0	0	0	0	0					
R	11	17	19	19	20	19	20	19	20	20	20	20	20	20	20					
L	2	1	1	1	1	1	1	0	0	1	1	0	0	0	1	3	1	1	26	116
M	7	3	1	4	4	2	2	3	3	1	6	2	4	3	3					
R	11	16	18	15	15	17	17	17	17	18	13	18	16	17	15					
L	2	0	2	3	1	3	0	3	1	1	2	1	1	1	0	3	1	1	26	117
M	8	8	1	1	1	0	1	0	0	1	0	3	2	2	1					
R	10	12	17	16	18	17	19	17	19	18	18	16	17	17	19					
L	10	1	0	0	1	0	0	0	0	0	0	0	0	0	0	3	1	1	23	118
M	5	1	1	0	0	2	4	0	0	0	0	0	0	0	0					
R	5	18	19	20	19	18	16	20	20	20	20	20	20	20	20					
L	7	6	5	1	4	3	1	1	0	1	0	0	2	1	0	3	1	1	25	119
M	7	7	4	5	4	2	3	1	2	2	1	2	2	2	2					
R	6	7	11	14	12	15	16	18	18	17	19	18	16	17	18					

TABLE E 7 - RAW DATA FOR GROUP 3 UNDER TREATMENT 1 - MALES (CONTINUED)



## BLOCKS OF 20 TRIALS

EVENT 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 GRP SEX TRT AGE SUBJ.

L 10 0 0 1 3 0 3 2 0 1 1 1 0 0 1 3 1 1 23 120

M 7 4 3 2 1 3 1 0 2 1 0 1 1 5 2

R 3 16 17 17 16 17 16 18 18 18 19 18 19 15 17

L 5 0 2 2 1 0 0 0 0 1 0 0 0 0 0 3 1 1 24 121

M 9 1 1 1 1 0 2 1 3 1 0 1 1 1 0

R 6 19 17 17 18 20 18 19 17 18 20 19 19 19 20

L 8 2 4 4 1 0 0 2 0 0 2 1 0 0 0 3 1 1 24 122

M 3 3 0 1 1 0 1 1 2 1 1 0 0 1 1

R 9 15 16 15 18 20 19 17 18 19 17 19 20 19 19

L 7 0 2 0 2 1 0 1 0 1 1 0 0 0 0 3 1 1 24 123

M 6 11 4 7 6 1 0 5 1 2 0 0 1 1 0

R 7 9 14 13 12 18 20 14 19 17 19 20 19 19 20

L 14 0 0 0 0 0 0 0 0 0 0 0 0 0 0 3 1 1 25 124

M 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0

R 6 20 20 20 20 20 20 20 20 20 20 20 20 20 20

L 6 1 1 1 1 1 0 2 0 2 3 0 1 1 0 3 1 1 24 125

M 4 6 2 2 2 1 3 1 3 0 5 5 4 2 3

R 10 13 17 17 17 18 17 17 17 18 12 15 15 17 17

## MEANS FOR MOST FREQUENT EVENT

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

7.2 14.9 16.3 16.5 16.7 18.2 18.4 18.0 18.1 18.4 17.9 18.4 18.5 18.3 18.3

TABLE E 7 - RAW DATA FOR GROUP 3 UNDER TREATMENT 1 - MALES



## BLOCKS OF 20 TRIALS

EVENT	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	GRP	SEX	TRT	AGE	SUBJ.
L	1	4	3	3	3	3	2	3	2	10	15	14	14	13	0	3	1	2	23	137
M	1	5	4	4	5	4	4	4	2	3	3	4	4	5	0					
R	18	11	13	13	12	13	14	13	16	7	2	2	2	2	0					
L	5	1	1	2	2	2	2	3	2	2	12	14	15	14	15	3	1	2	26	138
M	2	1	4	3	5	5	4	3	3	4	4	4	3	5	4					
R	13	18	15	15	13	13	14	14	15	14	4	2	2	1	1					
L	5	2	2	2	2	3	1	2	2	2	9	13	14	14	15	3	1	2	27	139
M	8	0	4	2	2	3	4	4	4	4	4	4	4	4	4					
R	7	18	14	16	16	14	15	14	14	14	5	3	2	2	1					
L	2	0	2	0	0	1	1	1	2	1	13	17	17	18	18	3	1	2	27	140
M	1	0	0	0	0	0	0	1	0	1	1	1	1	1	1					
R	17	20	18	20	20	19	19	18	18	18	6	2	2	1	1					
L	3	2	2	0	2	1	0	1	1	1	10	19	14	13	16	3	1	2	23	143
M	7	2	3	1	3	2	2	2	2	2	3	1	4	4	3					
R	10	16	15	19	15	17	18	17	17	17	7	0	2	3	1					
L	4	2	1	0	0	2	2	1	1	1	12	18	16	19	19	3	1	2	40	144
M	8	0	0	0	1	3	3	2	3	1	3	1	2	0	0					
R	8	18	19	20	19	15	15	17	16	18	5	1	2	1	1					
L	10	4	2	2	1	4	3	2	2	2	12	12	14	14	14	3	1	2	33	145
M	9	3	0	2	4	3	3	5	5	4	3	5	4	4	4					
R	1	13	18	16	15	13	14	13	13	14	5	3	2	2	2					
L	7	2	1	1	1	2	1	1	1	2	12	18	15	18	16	3	1	2	35	146
M	3	4	4	2	1	1	1	3	3	2	3	1	3	1	2					
R	10	14	15	17	18	17	18	16	16	16	5	1	2	1	2					
L	4	1	0	0	2	3	0	1	2	1	12	18	19	18	18	3	1	2	27	147
M	1	0	1	1	1	1	1	1	1	1	4	1	1	1	1					
R	15	19	19	19	17	16	19	18	17	18	4	1	0	1	1					

TABLE E 8 - RAW DATA FOR GROUP 3 UNDER TREATMENT 2 - MALES (CONTINUED)

2000 05 20 08:01

## BLOCKS OF 20 TRIALS

EVENT 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 GRP SEX TRT AGE SUBJ.

L 8 4 13 5 3 2 2 2 4 1 7 13 15 14 14 3 1 2 33 149

M 6 6 0 0 1 3 3 5 2 5 5 5 2 3 5 3 1 2 33 149

R 6 10 7 15 16 15 15 13 14 14 8 2 2 3 1 1 2 33 149

L 7 5 5 2 3 4 1 2 2 2 12 13 13 13 13 3 1 2 24 150

M 6 6 5 2 0 1 2 4 5 5 3 5 5 5 5 5 2 24 150

R 7 9 10 16 17 15 17 14 13 13 5 2 2 2 2 2 2 24 150

L 5 1 2 2 3 2 2 2 2 2 13 14 14 14 14 3 1 2 26 166

M 8 3 2 2 2 4 4 4 4 4 4 4 4 4 4 4 2 26 166

R 7 16 16 16 15 14 14 14 14 14 3 2 2 2 2 2 2 26 166

L 8 5 2 2 2 2 2 2 2 2 9 14 15 14 14 3 1 2 29 167

M 5 2 2 6 4 4 4 4 4 4 8 4 3 4 4 4 2 29 167

R 7 13 16 12 14 14 14 14 14 14 3 2 2 2 2 2 2 29 167

L 4 9 3 2 2 2 2 2 2 2 15 13 14 14 14 3 1 2 26 172

M 5 3 4 5 5 4 4 4 4 4 2 5 4 4 4 4 2 26 172

R 6 8 13 13 13 14 14 14 14 14 3 2 2 2 2 2 2 26 172

L 2 0 1 3 2 2 2 2 2 2 13 14 14 14 14 3 1 2 42 173

M 8 2 4 4 3 3 6 5 4 5 3 4 4 4 4 4 2 42 173

R 10 18 15 13 15 15 12 13 14 13 4 2 2 2 2 2 2 42 173

## MEANS FOR MOST FREQUENT EVENT

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

9.5 14.7 14.9 16.0 15.7 14.9 15.5 14.8 15.0 14.5 11.7 14.9 14.9 14.9 14.3

TABLE E 8 - RAW DATA FOR GROUP 3 UNDER TREATMENT 2 - MALES



## BLOCKS OF 20 TRIALS

EVENT	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	GRP	SEX	TRT	AGE	SUBJ.
L	7	10	8	7	10	7	7	7	9	7	5	7	7	5	6	3	1	3	29	126
M	1	0	0	0	1	2	0	4	3	2	4	3	5	6	6					
R	12	10	12	13	9	11	13	9	8	11	11	11	8	9	8					
L	6	5	4	5	5	1	2	1	1	1	4	0	2	1	0	3	1	3	28	127
M	5	10	3	4	5	2	8	7	2	5	3	2	2	3	2					
R	9	5	13	11	10	17	10	12	17	14	13	18	16	16	18					
L	7	6	6	5	5	0	2	1	2	0	2	2	1	1	1	3	1	3	23	130
M	5	9	7	4	5	6	3	2	3	2	3	3	4	4	6					
R	8	5	7	11	10	14	15	17	15	18	15	15	15	15	13					
L	7	6	4	0	5	1	2	0	1	1	2	0	4	2	2	3	1	3	20	131
M	6	4	6	10	4	6	7	9	7	8	6	8	4	5	6					
R	7	10	10	10	11	13	11	11	12	11	12	12	12	13	12					
L	3	8	5	6	5	2	2	3	1	1	1	2	2	4	2	3	1	3	25	132
M	6	4	5	7	6	3	7	5	7	5	6	6	9	7	6					
R	11	8	10	7	9	15	11	12	12	14	13	12	9	9	12					
L	2	0	0	0	0	0	0	0	0	0	0	1	1	1	1	3	1	3	26	133
M	2	3	2	1	3	2	3	5	4	7	5	4	7	7	5					
R	16	17	18	19	17	18	17	15	16	13	15	15	12	12	14					
L	3	8	4	7	3	5	5	3	3	3	3	3	4	2	4	3	1	3	27	218
M	6	4	5	7	6	5	3	6	4	5	4	3	4	5	2					
R	11	8	11	6	11	10	12	11	13	12	13	14	12	13	14					
L	2	2	1	0	0	0	0	0	0	0	0	0	0	0	0	3	1	3	30	310
M	5	2	0	1	0	0	0	0	0	0	0	0	0	0	0					
R	13	16	19	19	20	20	20	20	20	20	20	20	20	20	20					
L	7	9	6	8	11	5	5	3	0	0	0	0	0	0	0	3	1	3	28	311
M	7	4	3	7	5	3	4	2	0	0	0	0	0	0	0					
R	6	7	11	5	4	12	11	15	20	20	20	20	20	20	20					

TABLE E 9 - RAW DATA FOR GROUP 3 UNDER TREATMENT 3 - MALES (CONTINUED)



## BLOCKS OF 20 TRIALS

EVENT 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 GRP SEX TRT AGE SUBJ.

L	4	2	5	10	10	2	6	4	6	5	5	4	5	5	3	1	3	40	313
M	4	7	7	6	3	4	3	3	1	3	4	3	4	3	4				

R	12	11	8	4	7	14	11	13	13	12	11	12	12	12	11				
---	----	----	---	---	---	----	----	----	----	----	----	----	----	----	----	--	--	--	--

L	6	5	5	7	6	7	3	2	3	3	8	7	4	6	6	3	1	3	31
M	6	8	5	6	0	5	4	5	1	5	4	5	2	4	4				
R	8	7	10	7	14	8	13	13	16	12	8	8	14	10	10				314

L	2	7	7	6	4	3	2	4	1	2	2	2	1	0	0	3	1	3	27
M	1	0	0	0	1	2	0	0	0	0	0	2	1	1	0				
R	17	13	13	14	15	15	18	16	19	18	18	16	18	19	20				315

L	8	11	6	6	8	5	4	1	7	5	4	5	6	3	5	3	1	3	34
M	8	5	7	6	3	6	5	7	2	2	4	1	4	5	4				
R	4	4	7	8	9	9	11	12	11	13	12	14	10	12	11				316

L	6	6	4	4	1	4	3	7	2	5	4	3	2	3	1	3	1	3	41
M	6	9	7	5	6	4	8	6	8	6	6	8	8	5	7				
R	8	5	9	11	13	12	9	7	10	9	10	9	10	12	12				317

L	8	10	1	0	0	0	0	0	0	0	0	0	0	0	0	3	1	3	31
M	5	4	0	0	0	0	0	0	0	0	0	0	0	0	0				
R	7	6	19	20	20	20	20	20	20	20	20	20	20	20	20				318

## MEANS FCR MOST FREQUENT EVENT

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
9.9	8.8	11.8	11.0	11.9	13.9	13.5	13.5	14.8	14.5	14.1	14.4	13.9	14.1	14.3

TABLE E 9 - RAW DATA FOR GROUP 3 UNDER TREATMENT 3 - MALES

Case	Exposed	Unexposed	Total	Control	Exposed	Unexposed	Total	Relative Risk
1	1	0	1	1	1	0	1	1.0
2	1	0	1	1	1	0	1	1.0
3	1	0	1	1	1	0	1	1.0
4	1	0	1	1	1	0	1	1.0
5	1	0	1	1	1	0	1	1.0
6	1	0	1	1	1	0	1	1.0
7	1	0	1	1	1	0	1	1.0
8	1	0	1	1	1	0	1	1.0
9	1	0	1	1	1	0	1	1.0
10	1	0	1	1	1	0	1	1.0
11	1	0	1	1	1	0	1	1.0
12	1	0	1	1	1	0	1	1.0
13	1	0	1	1	1	0	1	1.0
14	1	0	1	1	1	0	1	1.0
15	1	0	1	1	1	0	1	1.0
16	1	0	1	1	1	0	1	1.0
17	1	0	1	1	1	0	1	1.0
18	1	0	1	1	1	0	1	1.0
19	1	0	1	1	1	0	1	1.0
20	1	0	1	1	1	0	1	1.0
21	1	0	1	1	1	0	1	1.0
22	1	0	1	1	1	0	1	1.0
23	1	0	1	1	1	0	1	1.0
24	1	0	1	1	1	0	1	1.0
25	1	0	1	1	1	0	1	1.0
26	1	0	1	1	1	0	1	1.0
27	1	0	1	1	1	0	1	1.0
28	1	0	1	1	1	0	1	1.0
29	1	0	1	1	1	0	1	1.0
30	1	0	1	1	1	0	1	1.0
31	1	0	1	1	1	0	1	1.0
32	1	0	1	1	1	0	1	1.0
33	1	0	1	1	1	0	1	1.0
34	1	0	1	1	1	0	1	1.0
35	1	0	1	1	1	0	1	1.0
36	1	0	1	1	1	0	1	1.0
37	1	0	1	1	1	0	1	1.0
38	1	0	1	1	1	0	1	1.0
39	1	0	1	1	1	0	1	1.0
40	1	0	1	1	1	0	1	1.0
41	1	0	1	1	1	0	1	1.0
42	1	0	1	1	1	0	1	1.0
43	1	0	1	1	1	0	1	1.0
44	1	0	1	1	1	0	1	1.0
45	1	0	1	1	1	0	1	1.0
46	1	0	1	1	1	0	1	1.0
47	1	0	1	1	1	0	1	1.0
48	1	0	1	1	1	0	1	1.0
49	1	0	1	1	1	0	1	1.0
50	1	0	1	1	1	0	1	1.0
51	1	0	1	1	1	0	1	1.0
52	1	0	1	1	1	0	1	1.0
53	1	0	1	1	1	0	1	1.0
54	1	0	1	1	1	0	1	1.0
55	1	0	1	1	1	0	1	1.0
56	1	0	1	1	1	0	1	1.0
57	1	0	1	1	1	0	1	1.0
58	1	0	1	1	1	0	1	1.0
59	1	0	1	1	1	0	1	1.0
60	1	0	1	1	1	0	1	1.0
61	1	0	1	1	1	0	1	1.0
62	1	0	1	1	1	0	1	1.0
63	1	0	1	1	1	0	1	1.0
64	1	0	1	1	1	0	1	1.0
65	1	0	1	1	1	0	1	1.0
66	1	0	1	1	1	0	1	1.0
67	1	0	1	1	1	0	1	1.0
68	1	0	1	1	1	0	1	1.0
69	1	0	1	1	1	0	1	1.0
70	1	0	1	1	1	0	1	1.0
71	1	0	1	1	1	0	1	1.0
72	1	0	1	1	1	0	1	1.0
73	1	0	1	1	1	0	1	1.0
74	1	0	1	1	1	0	1	1.0
75	1	0	1	1	1	0	1	1.0
76	1	0	1	1	1	0	1	1.0
77	1	0	1	1	1	0	1	1.0
78	1	0	1	1	1	0	1	1.0
79	1	0	1	1	1	0	1	1.0
80	1	0	1	1	1	0	1	1.0
81	1	0	1	1	1	0	1	1.0
82	1	0	1	1	1	0	1	1.0
83	1	0	1	1	1	0	1	1.0
84	1	0	1	1	1	0	1	1.0
85	1	0	1	1	1	0	1	1.0
86	1	0	1	1	1	0	1	1.0
87	1	0	1	1	1	0	1	1.0
88	1	0	1	1	1	0	1	1.0
89	1	0	1	1	1	0	1	1.0
90	1	0	1	1	1	0	1	1.0
91	1	0	1	1	1	0	1	1.0
92	1	0	1	1	1	0	1	1.0
93	1	0	1	1	1	0	1	1.0
94	1	0	1	1	1	0	1	1.0
95	1	0	1	1	1	0	1	1.0
96	1	0	1	1	1	0	1	1.0
97	1	0	1	1	1	0	1	1.0
98	1	0	1	1	1	0	1	1.0
99	1	0	1	1	1	0	1	1.0
100	1	0	1	1	1	0	1	1.0

Relative Risk = 1.0

Case-control study: Relative Risk = 1.0

Relative Risk = 1.0

## BLOCKS OF 20 TRIALS

EVENT	1	2	3	4	5	6	7	8	9	10	GRP	SEX	TRT	AGE	SUBJ.
L	1	1	2	1	1	0	1	0	2	1	1	0	1	5	8
M	4	4	2	3	3	0	4	3	3	0					
R	15	15	16	16	16	20	15	17	15	19					
L	6	3	7	6	6	5	7	5	4	6	1	0	1	6	62
M	5	9	6	8	8	5	4	5	7	5					
R	9	8	7	6	6	10	9	10	9	9					
L	4	2	1	3	7	6	1	0	0	0	1	0	1	5	177
M	4	7	6	6	7	7	1	0	0	0					
R	12	19	13	11	6	7	18	20	20	20					
L	2	1	4	8	5	3	0	0	0	0	1	0	1	5	178
M	6	4	12	11	8	8	2	1	0	0					
R	12	15	4	1	7	9	18	16	20	20					
L	2	0	0	0	0	0	0	0	0	0	1	0	1	6	180
M	3	1	0	0	0	0	0	0	0	0					
R	15	19	20	20	20	20	20	20	20	20					
L	6	5	7	3	2	1	3	3	2	2	1	0	1	6	183
M	8	7	5	5	3	4	4	2	4	4					
R	6	8	8	12	15	15	13	15	14	14					
L	3	1	2	0	1	3	2	1	2	7	1	0	1	6	185
M	4	3	1	1	1	1	4	5	2	6					
R	13	16	17	19	18	16	14	14	16	7					
L	3	1	2	0	0	0	0	0	0	0	1	0	1	5	186
M	6	5	5	2	0	2	0	4	0	1					
R	3	8	13	18	20	18	20	16	20	19					
L	2	0	0	0	0	2	0	0	0	0	1	0	1	6	188
M	2	1	0	0	0	2	0	0	1	0					
R	4	19	20	3	20	16	20	20	19	20					

TABLE E 10 - RAW DATA FOR GROUP 1 UNDER TREATMENT 1 - FEMALES (CONTINUED)



BLOCKS OF 20 TRIALS

EVENT 1 2 3 4 5 6 7 8 9 10 GRP SEX TRT AGE SUBJ.

L	6	3	4	8	5	3	5	4	1	0	1	0	1	5	191
M	6	12	5	3	11	9	6	3	6	0					
R	8	5	11	9	4	8	9	13	13	20					
L	10	3	2	5	1	2	2	1	2	2	1	0	1	5	193
M	3	13	13	7	3	1	2	2	3	2					
R	0	4	5	8	16	17	16	17	15	16					
L	5	4	4	9	2	5	5	5	2	0	1	0	1	6	196
M	7	11	6	8	9	10	4	8	4	0					
R	8	5	10	3	9	5	11	7	14	20					
L	2	3	3	0	0	0	0	0	0	0	1	0	1	6	199
M	8	7	2	3	1	0	0	0	1	0					
R	6	10	15	17	19	20	20	20	19	20					
L	14	2	0	0	0	0	0	0	0	0	1	0	1	5	205
M	0	0	0	0	0	0	0	0	0	0					
R	6	18	20	20	20	20	20	20	20	20					
L	9	5	1	2	1	0	0	1	1	1	1	0	1	5	206
M	7	7	6	4	1	3	1	3	3	1					
R	4	8	13	14	12	10	19	16	16	18					

MEANS FOR MOST FREQUENT EVENT

1	2	3	4	5	6	7	8	9	10
8.1	11.8	12.8	11.8	13.9	14.1	16.1	16.1	16.7	17.5

TABLE E 10 - RAW DATA FOR GROUP 1 UNDER TREATMENT 1 - FEMALES

TABLE 1. Summary of the results of the 1991-1992 survey of the distribution of the 10 most common species of fish in the Great Lakes.

Species: 1. Yellow Perch, 2. Rock Bass, 3. White Perch, 4. Rock Bass, 5. Rock Bass, 6. Rock Bass, 7. Rock Bass, 8. Rock Bass, 9. Rock Bass, 10. Rock Bass.

Location: 1. Lake Michigan, 2. Lake Michigan, 3. Lake Michigan, 4. Lake Michigan, 5. Lake Michigan, 6. Lake Michigan, 7. Lake Michigan, 8. Lake Michigan, 9. Lake Michigan, 10. Lake Michigan.

Year: 1991, 1992, 1993, 1994, 1995, 1996, 1997, 1998, 1999, 2000.

Species	Location	Year	Count	Percentage	Notes
1	1	1991	100	100%	
1	1	1992	100	100%	
1	1	1993	100	100%	
1	1	1994	100	100%	
1	1	1995	100	100%	
1	1	1996	100	100%	
1	1	1997	100	100%	
1	1	1998	100	100%	
1	1	1999	100	100%	
1	1	2000	100	100%	
2	2	1991	100	100%	
2	2	1992	100	100%	
2	2	1993	100	100%	
2	2	1994	100	100%	
2	2	1995	100	100%	
2	2	1996	100	100%	
2	2	1997	100	100%	
2	2	1998	100	100%	
2	2	1999	100	100%	
2	2	2000	100	100%	
3	3	1991	100	100%	
3	3	1992	100	100%	
3	3	1993	100	100%	
3	3	1994	100	100%	
3	3	1995	100	100%	
3	3	1996	100	100%	
3	3	1997	100	100%	
3	3	1998	100	100%	
3	3	1999	100	100%	
3	3	2000	100	100%	
4	4	1991	100	100%	
4	4	1992	100	100%	
4	4	1993	100	100%	
4	4	1994	100	100%	
4	4	1995	100	100%	
4	4	1996	100	100%	
4	4	1997	100	100%	
4	4	1998	100	100%	
4	4	1999	100	100%	
4	4	2000	100	100%	
5	5	1991	100	100%	
5	5	1992	100	100%	
5	5	1993	100	100%	
5	5	1994	100	100%	
5	5	1995	100	100%	
5	5	1996	100	100%	
5	5	1997	100	100%	
5	5	1998	100	100%	
5	5	1999	100	100%	
5	5	2000	100	100%	
6	6	1991	100	100%	
6	6	1992	100	100%	
6	6	1993	100	100%	
6	6	1994	100	100%	
6	6	1995	100	100%	
6	6	1996	100	100%	
6	6	1997	100	100%	
6	6	1998	100	100%	
6	6	1999	100	100%	
6	6	2000	100	100%	
7	7	1991	100	100%	
7	7	1992	100	100%	
7	7	1993	100	100%	
7	7	1994	100	100%	
7	7	1995	100	100%	
7	7	1996	100	100%	
7	7	1997	100	100%	
7	7	1998	100	100%	
7	7	1999	100	100%	
7	7	2000	100	100%	
8	8	1991	100	100%	
8	8	1992	100	100%	
8	8	1993	100	100%	
8	8	1994	100	100%	
8	8	1995	100	100%	
8	8	1996	100	100%	
8	8	1997	100	100%	
8	8	1998	100	100%	
8	8	1999	100	100%	
8	8	2000	100	100%	
9	9	1991	100	100%	
9	9	1992	100	100%	
9	9	1993	100	100%	
9	9	1994	100	100%	
9	9	1995	100	100%	
9	9	1996	100	100%	
9	9	1997	100	100%	
9	9	1998	100	100%	
9	9	1999	100	100%	
9	9	2000	100	100%	
10	10	1991	100	100%	
10	10	1992	100	100%	
10	10	1993	100	100%	
10	10	1994	100	100%	
10	10	1995	100	100%	
10	10	1996	100	100%	
10	10	1997	100	100%	
10	10	1998	100	100%	
10	10	1999	100	100%	
10	10	2000	100	100%	

## BLOCKS OF 20 TRIALS

EVENT 1 2 3 4 5 6 7 8 9 10 GRP SEX TRT AGE SUBJ.

L 1 1 1 6 0 1 2 3 4 0 1 0 2 5 5

M 1 1 3 12 2 3 4 6 4 1

R 4 3 5 2 18 11 10 9 12 10

L 1 0 0 0 0 0 0 0 0 0 1 0 2 5 203

M 8 5 3 0 0 2 0 0 0 0

R 11 15 13 20 20 18 20 20 20 20

L 7 4 2 4 3 2 6 10 11 13 1 0 2 5 230

M 4 5 4 3 3 3 4 6 5 2

R 7 11 14 13 14 15 8 4 4 5

L 2 13 4 3 2 1 1 15 17 19 1 0 2 6 232

M 0 0 4 3 3 2 2 3 2 1

R 18 7 12 14 15 17 17 2 1 0

L 4 0 0 1 1 4 4 6 9 12 1 0 2 4 235

M 7 5 6 12 15 8 7 11 10 5

R 9 15 14 7 4 11 9 3 1 3

L 4 5 4 2 3 3 14 7 11 13 1 0 2 6 236

M 4 1 0 2 1 1 0 3 3 0

R 5 5 11 9 10 11 5 9 2 5

L 7 2 1 0 1 1 4 14 17 16 1 0 2 5 252

M 5 2 1 0 1 2 1 3 2 3

R 8 16 18 20 18 17 14 2 1 1

L 5 3 2 1 0 2 4 14 17 19 1 0 2 6 253

M 7 2 0 0 0 0 1 4 2 1

R 8 15 18 19 20 18 15 2 1 0

L 3 2 0 0 0 0 0 16 20 20 1 0 2 5 257

M 2 1 0 0 0 0 2 0 0 0

R 15 17 20 20 20 20 20 2 0 0

TABLE E 11 - RAW DATA FOR GROUP 1 UNDER TREATMENT 2 - FEMALES (CONTINUED)



## BLOCKS OF 20 TRIALS

EVENT 1 2 3 4 5 6 7 8 9 10 GRP SEX TRT AGE SUBJ.

L 3 4 1 1 2 1 3 17 16 15 1 0 2 5 265

M 3 4 4 5 2 3 0 2 2 3

R 6 12 15 14 16 16 17 1 2 2

L 2 1 0 2 2 0 3 18 19 20 1 0 2 5 266

M 2 2 2 1 0 0 0 0 0 0

R 7 17 18 17 18 20 17 2 1 0

L 3 1 2 4 3 3 8 16 18 16 1 0 2 6 270

M 6 3 1 0 1 0 3 2 0 0

R 11 16 17 16 16 17 9 2 2 4

L 4 2 3 3 4 1 3 9 15 13 1 0 2 6 271

M 3 11 5 8 4 6 6 4 4

R 13 7 12 9 12 13 11 5 1 3

L 5 7 5 2 2 1 6 16 16 15 1 0 2 6 272

M 4 4 6 4 2 1 0 0 0

R 11 9 9 14 14 17 13 4 4 5

L 6 3 0 3 2 4 5 11 16 14 1 0 2 4 277

M 3 2 0 0 6 5 4 3 1

R 0 9 18 16 11 10 10 5 1 5

## MEANS FCR MOST FREQUENT EVENT

1 2 3 4 5 6 7 8 9 10

8.9 11.6 14.3 14.0 15.1 15.4 13.0 11.5 13.7 13.7

TABLE E 11 - RAW DATA FOR GROUP 1 UNDER TREATMENT 2 - FEMALES



## BLOCKS OF 20 TRIALS

EVENT	1	2	3	4	5	6	7	8	9	10	GRP	SEX	TRT	AGE	SUBJ.
L	2	0	1	0	0	2	3	2	0	0	1	0	3	5	284
M	3	2	2	1	1	2	5	3	0	0					
R	15	18	17	19	20	16	12	15	20	20					
L	0	11	1	8	13	2	6	13	2	4	1	0	3	5	286
M	0	0	0	1	0	3	0	1	2	3					
R	20	9	19	11	7	10	14	6	16	13					
L	0	0	0	0	0	0	0	0	0	0	1	0	3	6	289
M	0	0	0	0	0	0	0	0	0	0					
R	20	20	20	20	20	20	20	20	20	20					
L	6	7	4	7	6	2	0	0	0	0	1	0	3	6	290
M	7	2	3	4	0	1	0	0	0	0					
R	7	11	13	9	14	17	20	20	20	20					
L	3	3	4	7	4	1	1	0	0	0	1	0	3	4	294
M	4	7	10	8	8	5	2	0	0	0					
R	13	10	6	5	8	14	17	20	20	20					
L	12	9	9	8	6	9	10	3	5	1	1	0	3	6	295
M	3	2	1	0	3	0	0	3	1	2					
R	5	9	10	12	11	11	10	14	14	17					
L	5	2	3	0	3	1	1	2	0	1	1	0	3	4	296
M	2	5	6	6	5	4	3	9	0	4					
R	12	13	11	14	12	15	16	9	20	15					
L	5	5	7	2	3	4	3	2	2	2	1	0	3	5	297
M	8	7	10	11	6	9	9	12	7	7					
R	4	8	3	7	11	7	8	6	11	11					
L	5	8	6	8	9	11	12	8	12	10	1	0	3	4	299
M	6	7	9	5	6	1	1	4	0	2					
R	9	5	5	7	5	8	7	8	8	8					

TABLE E 12 - RAW DATA FOR GROUP 1 UNDER TREATMENT 3 - FEMALES (CONTINUED)



## BLOCKS OF 20 TRIALS

EVENT 1 2 3 4 5 6 7 8 9 10 GRP SEX TRT AGE SUBJ.

L 11 11 8 10 9 8 11 10 10 9 1 0 3 5 300

M 0 0 0 0 0 0 0 0 0 0 0 0 0 0

R 9 9 12 10 11 12 9 10 10 11 0 0 0 0

L 1 2 2 1 0 0 2 4 2 2 1 0 3 6 305

M 5 1 0 0 0 0 0 2 1 0 0 0 0 0

R 14 17 18 19 20 20 18 14 17 18 0 0 0 0

L 0 0 0 0 0 0 0 0 0 0 1 0 3 6 306

M 7 2 0 0 0 0 0 0 0 0 0 0 0 0

R 13 18 20 20 20 20 20 20 20 20 0 0 0 0

L 2 5 11 5 9 3 2 0 1 0 1 0 3 5 307

M 7 6 3 2 3 1 0 0 0 1 0 0 0 0

R 5 8 6 12 8 9 18 20 19 19 0 0 0 0

L 1 1 2 3 1 0 2 6 2 5 1 0 3 6 308

M 1 1 2 3 3 0 2 1 3 0 0 0 0 0

R 15 18 16 14 16 20 16 13 11 15 0 0 0 0

L 8 5 9 5 4 8 8 4 7 5 1 0 3 4 309

M 6 9 7 8 3 5 6 10 5 8 0 0 0 0

R 6 6 4 7 6 7 2 6 8 7 0 0 0 0

## MEANS FOR MOST FREQUENT EVENT

1 2 3 4 5 6 7 8 9 10

11.1 11.9 12.0 12.4 12.6 13.7 13.8 13.4 15.6 15.6

TABLE E 12 - RAW DATA FOR GROUP 1 UNDER TREATMENT 3 - FEMALES



## BLOCKS OF 20 TRIALS

EVENT	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	GRP	SEX	TRT	AGE	SUBJ.
L	0	0	0	0	0	0	2	0	2	3	1	1	4	0	0	2	0	1	8	7
M	2	0	0	1	1	1	1	2	3	1	2	1	5	1	0					
R	18	20	20	19	19	19	17	18	15	16	17	18	11	19	20					
L	0	1	0	2	0	0	0	1	2	0	0	0	0	0	0	2	0	1	10	10
M	3	5	3	3	2	1	4	2	1	2	0	3	1	0	1					
R	17	14	17	15	18	19	16	17	17	18	20	17	19	20	19					
L	1	0	0	1	0	2	2	2	4	0	2	1	0	0	0	2	0	1	9	11
M	7	6	2	0	1	1	2	1	0	3	4	2	4	2	4					
R	12	14	18	19	19	17	16	17	16	17	14	17	16	18	16					
L	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	1	8	15
M	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0					
R	18	20	20	20	20	20	20	20	20	20	20	20	20	20	20					
L	4	4	4	4	5	3	4	3	1	5	7	3	8	8	3	2	0	1	8	16
M	9	7	5	3	5	6	4	1	4	5	6	5	1	1	7					
R	7	9	11	13	10	11	12	16	15	10	7	12	11	11	10					
L	9	5	5	3	6	4	3	2	3	3	2	2	4	3	0	2	0	1	9	17
M	6	10	9	7	4	7	4	7	8	4	8	4	5	8	6					
R	5	5	6	10	10	9	13	11	9	13	10	14	11	9	14					
L	2	2	2	0	1	0	0	0	0	0	0	0	0	1	0	2	0	1	9	18
M	5	3	0	0	1	0	0	0	0	0	0	0	0	1	0					
R	13	15	18	20	18	20	20	20	20	20	20	20	20	18	20					
L	6	5	6	5	7	7	3	7	4	5	6	4	4	4	2	2	0	1	9	50
M	7	6	4	7	7	5	4	5	8	3	4	3	6	2	4					
R	7	9	10	8	6	8	8	8	8	12	10	13	10	14	14					
L	0	0	1	0	0	0	0	3	0	0	0	0	2	0	0	2	0	1	8	52
M	1	1	0	0	0	0	1	0	0	2	1	0	2	0	0					
R	19	19	19	20	20	20	19	17	20	18	19	20	16	20	20					

TABLE E 13 - RAW DATA FOR GROUP 2 UNDER TREATMENT 1 - FEMALES (CONTINUED)



## BLOCKS OF 20 TRIALS

EVENT 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 GRP SEX TRT AGE SUBJ.

L 5 3 2 6 4 1 5 2 7 2 2 3 3 2 2 2 0 1 10 69  
M 2 5 4 3 1 5 3 5 3 5 3 1 3 3 5

R 13 12 14 11 15 14 12 13 10 13 15 16 14 15 13

L 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 0 1 9 76  
M 4 1 0 0 0 0 0 0 0 0 0 0 0 0 0  
R 15 19 20 20 20 19 20 20 20 20 20 20 20 20 20L 4 7 2 4 3 4 4 2 1 2 2 1 0 1 2 2 0 1 7 78  
M 8 5 5 4 2 2 2 2 4 3 0 1 2 5 2  
R 8 8 13 12 15 12 14 16 15 15 18 18 14 16L 4 1 4 1 2 1 1 2 2 4 1 0 0 0 1 2 0 1 9 91  
M 2 4 2 2 6 3 3 5 5 1 2 0 0 0 3  
R 14 15 14 17 12 16 16 13 13 14 17 20 20 20 14L 1 2 3 3 2 1 1 4 1 0 2 1 0 0 2 2 0 1 10 92  
M 2 2 1 1 2 2 2 2 3 4 3 2 2 1 1  
R 17 16 15 15 16 16 16 14 16 16 15 17 15 18 16L 17 13 2 2 1 0 1 0 6 1 3 0 0 0 0 2 0 1 6 93  
M 2 7 18 17 11 17 12 11 6 18 11 15 14 3 0  
R 0 0 0 1 8 3 7 9 8 0 6 5 6 16 20

## MEANS FOR MOST FREQUENT EVENT

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15  
12.2 13.0 14.3 14.7 15.1 14.9 15.0 15.3 14.8 14.8 15.2 16.5 15.1 16.8 16.8

TABLE E 13 - RAW DATA FOR GROUP 2 UNDER TREATMENT 1 - FEMALES



## BLOCKS OF 20 TRIALS

EVENT	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	GRP	SEX	TRT	AGE	SUBJ.
L	5	5	3	1	0	0	0	0	1	0	8	17	17	14	17	2	0	2	6	3
M	8	6	2	1	2	2	1	3	2	0	3	3	0	2	2					
R	7	9	15	18	18	18	19	17	17	20	9	0	0	1	1					
L	5	2	0	0	0	0	1	0	0	0	11	20	20	20	19	2	0	2	8	19
M	7	2	3	2	2	1	0	0	0	0	1	0	0	0	1					
R	8	16	17	18	18	19	19	20	20	20	8	0	0	0	0					
L	4	4	3	8	5	8	2	0	0	10	9	6	7	12	17	2	0	2	7	25
M	6	6	8	6	4	3	3	2	0	1	1	7	4	3	3					
R	7	9	9	6	9	9	15	18	20	9	10	7	9	5	0					
L	2	0	3	1	0	0	0	0	0	7	16	18	16	15	19	2	0	2	9	26
M	4	0	2	0	0	2	2	0	0	2	2	1	2	3	0					
R	7	20	15	19	20	18	18	20	20	11	2	1	2	2	1					
L	5	6	3	1	0	1	0	0	0	0	5	17	15	15	16	2	0	2	7	34
M	6	6	3	1	1	0	0	0	0	0	2	2	3	2	3					
R	9	8	14	18	19	19	20	20	20	20	13	1	2	3	1					
L	4	2	1	0	2	2	2	2	2	2	12	16	16	16	16	2	0	2	9	38
M	1	0	0	0	2	2	2	2	2	2	1	2	2	2	2					
R	15	18	19	20	16	16	16	16	16	16	7	2	2	2	2					
L	5	0	0	0	0	0	8	8	2	1	0	9	7	8	20	2	0	2	7	39
M	7	0	0	0	0	0	4	5	3	2	4	7	4	11	0					
R	8	20	20	20	20	20	8	7	15	17	16	4	9	1	0					
L	5	7	8	5	3	1	4	1	0	0	10	16	17	17	16	2	0	2	8	42
M	8	8	6	6	5	5	1	2	3	2	4	2	0	0	0					
R	5	5	6	9	12	14	15	17	17	18	6	2	2	3	4					
L	8	4	5	3	3	7	6	2	1	1	6	14	20	20	20	2	0	2	7	45
M	7	7	7	7	5	2	2	1	2	0	5	3	0	0	0					
R	5	9	8	10	11	11	12	17	17	19	9	3	0	0	0					

TABLE E 14 - RAW DATA FOR GROUP 2 UNDER TREATMENT 2 - FEMALES (CONTINUED)



## BLOCKS OF 20 TRIALS

EVENT 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 GRP SEX TRT AGE SUBJ.

L 7 3 3 4 4 3 3 2 2 2 12 18 16 15 18 2 0 2 11 46

M 4 2 1 0 0 0 3 2 2 2 1 1 0 1 1 1 1 1 1 1

R 9 15 16 16 16 17 14 16 16 16 7 1 4 4 1 1 1 1 1 1

L 6 5 7 7 8 4 4 1 0 0 13 18 20 20 20 2 0 2 7 48

M 9 7 7 6 5 6 1 3 1 0 2 1 0 0 0 0 0 0 0 0

R 5 8 6 7 7 6 15 16 19 15 5 1 0 0 0 0 0 0 0 0

L 7 7 6 5 5 6 4 6 6 5 5 12 15 19 17 2 0 2 12 79

M 6 8 8 10 7 8 9 8 8 8 8 5 2 1 3 3 3 3 3 3

R 7 5 6 5 8 6 7 6 6 7 7 3 2 0 0 0 0 0 0 0

L 2 3 0 0 0 2 10 16 18 17 20 16 15 9 14 2 0 2 10 83

M 5 4 4 4 4 2 3 2 2 3 0 3 3 5 6 6 6 6 6

R 13 13 16 16 16 16 5 2 0 0 0 0 2 6 0 2 0 2 0

L 4 1 0 0 1 0 1 10 10 10 12 15 14 17 17 2 0 2 9 84

M 3 4 4 2 2 2 5 5 4 3 2 2 3 0 0 0 0 0 0

R 11 11 12 13 16 18 13 4 6 7 6 3 3 0 0 0 0 0 0

L 2 2 2 1 0 0 0 0 2 4 4 12 12 17 14 2 0 2 10 88

M 3 2 4 3 1 2 0 2 0 0 5 3 5 1 3 3 3 3 3

R 4 14 14 16 19 18 20 18 18 16 10 5 2 2 3 3 3 3 3

## MEANS FOR MOST FREQUENT EVENT

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

8.0 12.0 12.9 14.1 15.0 15.0 14.4 14.3 15.1 14.1 9.5 14.9 15.1 15.6 17.3 17.3 17.3 17.3 17.3 17.3

TABLE E 14 - RAW DATA FOR GROUP 2 UNDER TREATMENT 2 - FEMALES



## BLOCKS OF 20 TRIALS

EVENT	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	GRP	SEX	TRT	AGE	SUBJ.
L	7	9	10	8	9	10	7	3	7	3	3	4	5	7	10	2	0	3	10	28
M	2	0	0	2	1	0	1	0	1	5	4	4	6	5	6					
R	7	11	10	10	10	10	12	8	7	7	6	5	5	8	4					
L	7	10	6	9	7	8	6	13	13	10	9	10	10	7	15	2	0	3	7	30
M	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0					
R	11	10	14	11	13	12	14	7	7	10	11	10	10	13	5					
L	7	4	2	1	6	4	6	4	3	1	2	2	2	1	1	2	0	3	10	32
M	8	2	8	10	6	6	7	5	5	6	6	5	6	9	6					
R	5	14	10	9	8	10	7	11	12	13	13	13	12	10	13					
L	3	6	7	2	5	3	1	2	2	1	1	0	1	0	0	2	0	3	7	33
M	5	4	7	7	5	4	0	0	0	0	0	0	0	0	0					
R	12	3	6	11	10	13	19	18	18	19	19	20	19	20	20					
L	5	8	6	12	10	13	10	5	7	5	4	3	4	4	2	2	0	3	9	82
M	8	10	11	7	8	4	6	12	8	9	10	9	10	7	9					
R	7	2	3	1	2	3	4	3	5	6	6	8	6	9	9					
L	13	13	16	16	16	16	5	2	0	0	0	0	2	6	0	2	0	3	10	83
M	5	4	4	4	4	2	3	2	2	3	0	3	3	5	6					
R	2	3	0	0	0	2	10	16	18	17	20	16	15	9	14					
L	11	11	12	13	16	18	13	4	6	7	6	3	3	3	8	2	0	3	9	84
M	3	4	4	2	2	2	5	5	4	3	2	2	3	5	0					
R	6	5	4	5	2	0	1	10	10	10	12	15	14	12	12					
L	4	5	6	6	5	4	5	3	3	5	5	8	7	5	6	2	0	3	11	98
M	4	9	8	9	5	7	6	8	7	4	5	6	5	4	5					
R	5	6	6	6	10	9	9	8	10	11	10	6	8	9	9					
L	10	7	5	3	4	4	5	5	6	6	8	8	5	6	6	2	0	3	7	100
M	6	7	12	12	9	9	11	10	7	9	6	5	12	8	5					
R	4	6	3	5	6	7	4	5	7	5	6	7	3	12	9					

TABLE E 15 - RAW DATA FOR GROUP 2 UNDER TREATMENT 3 - FEMALES (CONTINUED)

**Author's address:** Department of Mathematics, University of California at San Diego, La Jolla, CA 92037, U.S.A.  
E-mail: [shashikanth@ucsd.edu](mailto:shashikanth@ucsd.edu)

## BLOCKS OF 20 TRIALS

EVENT 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 GRP SEX TRT AGE SUBJ.

L 2 6 4 6 6 7 7 7 5 8 5 7 7 6 6 2 0 3 9 237

M 4 8 8 8 6 7 7 7 9 6 8 7 7 6 8

R 2 6 8 6 8 7 6 6 6 6 7 6 6 8 6

L 6 9 7 6 6 5 6 6 8 6 5 8 7 6 7 2 0 3 8 238

M 5 7 10 9 12 8 11 10 9 11 10 9 13 10 10

R 1 4 3 5 2 7 3 4 3 3 5 3 0 4 3

L 8 4 7 6 6 5 6 8 8 8 8 4 5 8 9 2 0 3 10 241

M 10 8 9 9 9 11 8 10 5 8 9 10 8 6 6

R 2 8 4 5 5 4 6 2 7 4 3 6 7 6 5

L 8 7 7 5 8 8 5 7 7 9 6 7 6 7 5 2 0 3 6 244

M 6 7 7 9 3 5 7 7 7 6 8 9 8 7 11

R 6 6 6 6 9 7 8 6 6 5 6 4 6 6 4

L 7 7 6 7 5 6 6 5 4 4 5 7 3 7 7 2 0 3 9 247

M 7 9 8 9 7 6 3 7 3 4 4 3 9 7 6

R 3 3 6 5 6 8 11 8 13 12 11 10 7 6 7

L 5 7 5 6 6 4 5 4 3 3 2 3 3 4 2 2 0 3 10 248

M 5 4 2 4 3 3 3 1 4 2 2 1 3 2 2

R 9 9 13 10 10 13 12 15 13 15 16 16 14 14 16

## MEANS FOR MOST FREQUENT EVENT

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

5.5 6.4 6.4 6.3 6.7 7.5 8.4 8.5 9.5 9.5 10.1 9.7 8.8 9.7 9.1

TABLE E 15 - RAW DATA FOR GROUP 2 UNDER TREATMENT 3 - FEMALES

• Low: 300 TAT 8-12 780

## BLOCKS OF 20 TRIALS

EVENT	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	GRP	SEX	TRT	AGE	SUBJ.
L	0	0	0	1	2	2	1	1	0	1	2	1	0	0	0	3	0	1	13	70
M	1	2	1	2	2	2	1	2	3	2	2	3	0	0	0					
R	19	18	19	17	16	16	18	17	17	17	16	16	20	20	20					
L	7	3	0	2	1	2	2	0	1	0	2	1	0	1	4	3	0	1	17	135
M	9	7	5	3	4	2	2	9	4	2	2	2	0	2	2					
R	4	10	15	15	15	16	16	11	15	18	16	17	20	17	14					
L	2	1	1	0	0	0	0	1	0	0	1	0	1	0	0	3	0	1	49	153
M	3	6	2	0	0	0	2	2	1	0	3	1	0	0	1					
R	15	13	17	20	20	20	18	17	19	20	16	19	19	20	19					
L	2	1	2	2	3	3	1	1	2	0	1	2	0	1	1	3	0	1	21	156
M	5	4	4	2	4	1	3	3	1	2	3	0	2	2	2					
R	13	15	14	16	13	16	16	16	17	18	16	18	18	17	17					
L	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	1	56	157
M	5	1	0	0	0	0	0	0	0	0	0	0	0	0	0					
R	13	19	20	20	20	20	20	20	20	20	20	20	20	20	20					
L	4	3	2	0	1	0	2	0	2	1	4	0	3	5	0	3	0	1	24	158
M	3	2	2	6	0	2	1	4	2	4	1	0	4	0	5					
R	13	15	16	14	19	18	17	16	16	15	15	20	13	15	17					
L	7	7	2	2	3	2	5	2	2	0	1	0	0	2	1	3	0	1	21	159
M	6	3	2	1	0	2	2	2	1	3	3	3	2	0	0					
R	7	10	16	17	17	16	13	16	17	17	16	17	18	18	19					
L	4	2	2	3	0	0	0	0	0	0	0	0	1	2	0	3	0	1	18	161
M	3	3	2	2	3	1	1	3	3	3	3	3	2	4	3					
R	13	15	16	15	17	19	19	17	17	17	17	17	17	14	17					
L	7	6	2	3	2	1	0	0	0	1	1	0	0	0	0	3	0	1	19	162
M	10	6	4	1	2	2	1	2	3	0	0	2	0	1	0					
R	3	8	14	16	16	17	19	18	17	19	19	18	20	19	20					

TABLE E 16 - RAW DATA FOR GROUP 3 UNDER TREATMENT 1 - FEMALES (CONTINUED)

# STATE OF TEXAS

COUNTY OF DALLAS, TEXAS, this 1st day of May, 1900.

Before me, the undersigned authority, on this day personally appeared \_\_\_\_\_, known to me to be the person whose name is subscribed to the foregoing instrument, acknowledged to me that he executed the same for the purposes and consideration therein expressed.

Given under my hand and seal of office this 1st day of May, 1900.

Notary Public in and for the State of Texas.

My commission expires this 1st day of \_\_\_\_\_, 1900.

Witness my hand and seal of office this 1st day of May, 1900.

Notary Public in and for the State of Texas.

My commission expires this 1st day of \_\_\_\_\_, 1900.

Witness my hand and seal of office this 1st day of May, 1900.

Notary Public in and for the State of Texas.

My commission expires this 1st day of \_\_\_\_\_, 1900.

Witness my hand and seal of office this 1st day of May, 1900.

Notary Public in and for the State of Texas.

My commission expires this 1st day of \_\_\_\_\_, 1900.

Witness my hand and seal of office this 1st day of May, 1900.

Notary Public in and for the State of Texas.

My commission expires this 1st day of \_\_\_\_\_, 1900.

Witness my hand and seal of office this 1st day of May, 1900.

Notary Public in and for the State of Texas.

## BLOCKS OF 20 TRIALS

EVENT 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 GRP SEX TRT AGE SUBJ.

L 7 2 1 0 1 1 2 1 3 2 1 1 1 2 2 3 0 1 20 163

M 4 2 5 2 2 0 3 4 2 7 8 4 3 1 3 3 3 1 20 163

R 9 16 14 18 17 19 15 15 11 11 11 15 16 17 15 15 15 15 15 15

L 6 1 3 2 2 3 4 3 2 0 2 3 2 6 1 3 0 1 21 164

M 4 3 3 2 0 2 2 1 2 2 0 2 0 2 3 3 3 2 21 164

R 10 16 14 16 18 15 14 16 16 18 18 15 18 12 16 16 16 12 21 164

L 6 3 1 3 2 1 2 3 3 3 3 1 2 3 3 3 0 1 21 165

M 7 7 4 3 2 1 3 4 3 3 4 5 2 5 3 3 3 1 21 165

R 7 10 15 14 16 18 15 13 14 14 13 14 16 12 14 14 14 12 21 165

L 8 2 3 3 2 1 2 2 1 1 1 0 2 1 2 3 0 1 20 222

M 6 6 3 4 6 2 1 2 6 0 2 1 1 1 1 1 1 1 20 222

R 6 12 14 13 12 17 17 16 13 19 17 19 17 18 17 17 17 17 20 222

L 4 2 0 0 2 1 1 1 0 0 0 0 0 0 0 3 0 1 17 223

M 3 0 0 0 1 0 0 1 0 1 0 0 0 0 0 0 0 0 17 223

R 11 18 20 20 17 19 19 18 20 19 20 20 20 20 20 20 20 20 17 223

L 10 3 1 1 0 2 2 1 0 0 3 0 1 1 1 3 0 1 18 224

M 3 8 7 3 7 5 4 4 6 7 2 2 2 5 1 3 3 1 18 224

R 7 9 12 16 13 13 14 15 14 13 15 18 17 14 18 14 14 14 18 224

## MEANS FOR MOST FREQUENT EVENT

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

10.0 13.6 15.7 16.5 16.4 17.3 16.7 16.1 16.5 17.0 16.3 17.5 17.9 16.9 17.5

TABLE E 16 - RAW DATA FOR GROUP 3 UNDER TREATMENT 1 - FEMALES



## BLOCKS OF 20 TRIALS

EVENT	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	GRP	SEX	TRT	AGE	SUBJ.
L	6	3	4	2	3	3	2	2	1	2	11	15	15	12	14	3	0	2	21	141
M	9	4	4	2	6	3	6	4	5	3	5	4	3	5	4					
R	5	13	12	16	11	14	12	14	14	15	4	1	2	3	2					
L	4	3	2	2	0	2	1	2	1	2	10	16	15	14	14	3	0	2	24	142
M	7	3	3	1	1	0	1	3	2	2	3	2	3	3	2					
R	9	14	15	17	19	18	18	15	17	16	7	2	2	3	4					
L	8	2	2	1	2	2	2	2	2	11	11	15	14	14	14	3	0	2	21	152
M	6	5	2	4	3	5	4	4	4	5	7	3	4	4	4					
R	6	13	16	15	15	13	14	14	14	4	2	2	2	2	2					
L	3	3	3	5	2	3	3	2	0	13	14	12	15	14	14	3	0	2	14	155
M	1	4	4	3	3	3	3	4	3	3	4	5	3	4	4					
R	16	13	13	12	15	14	14	14	17	4	2	3	2	2	2					
L	5	2	2	3	2	2	2	3	2	2	13	12	15	14	14	3	0	2	19	168
M	6	4	4	3	1	4	4	3	4	3	3	7	3	4	4					
R	9	14	14	14	17	14	14	14	14	15	4	1	2	2	2					
L	7	2	3	2	2	3	2	2	2	2	13	14	14	14	14	3	0	2	18	169
M	6	5	5	4	5	5	4	4	4	4	3	4	4	4	4					
R	7	13	12	14	13	12	14	14	14	14	4	2	2	2	2					
L	7	3	1	0	3	4	5	1	1	3	9	16	16	16	15	3	0	2	51	170
M	6	3	3	3	2	1	1	1	1	1	4	0	0	0	3					
R	7	13	16	17	15	15	14	18	18	16	7	4	4	4	2					
L	4	1	4	4	4	4	2	2	2	2	14	14	14	13	15	3	0	2	24	171
M	6	0	0	0	0	0	2	3	3	4	2	4	4	5	2					
R	10	19	16	16	16	16	16	15	15	14	4	2	2	2	3					
L	5	2	3	4	2	2	3	2	2	2	12	14	14	14	14	3	0	2	22	174
M	1	2	2	5	3	4	2	3	4	5	4	4	4	4	4					
R	14	16	15	11	15	14	15	15	14	13	4	2	2	2	2					

TABLE E 17 - RAW DATA FOR GROUP 3 UNDER TREATMENT 2 - FEMALES (CONTINUED)



## BLOCKS OF 20 TRIALS

EVENT 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 GRP SEX TRT AGE SUBJ.

L 3 2 2 2 2 2 2 2 2 11 15 15 14 15 14 3 0 2 21 175

M 4 2 1 3 2 3 4 4 4 4 3 3 4 3 4 4

R 13 16 17 15 16 15 14 16 14 5 2 2 2 2 2

L 3 2 3 4 3 2 2 2 2 12 15 14 14 14 14 3 0 2 20 176

M 5 3 3 1 1 2 2 1 3 3 3 4 4 4 4

R 12 15 14 15 16 16 16 17 15 5 2 2 2 2 2

L 11 5 4 3 2 2 2 2 2 3 12 14 14 14 14 3 0 2 22 225

M 4 2 2 2 5 4 4 4 4 4 3 4 4 4 4

R 5 13 14 15 13 14 14 14 14 13 5 2 2 2 2

L 11 3 6 5 6 0 4 3 1 1 11 20 19 20 20 3 0 2 20 226

M 7 5 3 2 2 1 3 4 2 3 0 0 0 0 0

R 2 12 11 13 12 14 13 13 17 16 9 0 1 0 0

L 5 5 2 2 2 2 2 2 2 2 10 14 14 14 14 3 0 2 21 227

M 6 3 2 3 1 3 3 4 2 4 5 4 4 4 4

R 9 12 11 15 17 15 15 14 16 14 5 2 2 2 2

L 6 10 17 14 13 14 14 14 14 14 9 2 2 2 2 3 0 2 20 229

M 7 7 3 4 5 4 4 4 4 4 4 4 4 4 4

R 7 3 0 2 2 2 2 2 2 2 7 14 14 14 14

## MEANS FOR MOST FREQUENT EVENT

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15  
8.7 13.3 13.1 13.8 14.1 13.7 13.7 13.9 14.3 11.1 11.9 13.8 13.9 13.6 13.7

TABLE E 17 - RAW DATA FOR GROUP 3 UNDER TREATMENT 2 - FEMALES



## BLOCKS OF 20 TRIALS

EVENT	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	GRP	SEX	TRT	AGE	SUBJ.
L	7	6	6	5	2	3	3	2	2	3	1	4	2	3	4	3	0	3	45	128
M	5	7	4	8	10	6	7	6	5	5	4	7	3	3	4					
R	8	7	10	7	8	11	10	12	13	12	15	9	15	14	12					
L	3	3	3	3	4	2	6	6	5	6	5	4	4	2	2	3	0	3	54	129
M	10	12	11	11	6	9	7	8	5	4	8	8	7	10	6					
R	7	5	6	6	10	9	7	6	10	11	7	8	9	8	12					
L	5	9	5	10	6	8	8	9	7	1	3	1	2	2	3	3	0	3	45	134
M	4	6	8	9	1	5	5	4	5	6	3	4	6	5	2					
R	11	5	7	1	13	7	7	7	8	13	14	15	12	13	15					
L	6	6	7	8	8	3	6	3	3	3	3	5	4	4	4	3	0	3	20	208
M	10	8	6	5	4	3	3	4	3	3	3	3	2	3	2					
R	4	6	7	7	8	14	11	13	14	14	14	12	14	13	14					
L	5	3	5	5	9	6	7	7	6	7	5	4	7	4	6	3	0	3	19	209
M	6	7	5	9	5	9	5	6	5	3	4	7	6	5	3					
R	9	10	10	6	6	5	8	7	9	10	11	9	7	11	11					
L	6	5	4	3	2	4	6	1	5	6	3	7	6	8	3	3	0	3	19	210
M	9	8	8	8	4	6	7	8	5	4	3	3	2	3	3					
R	5	7	8	9	14	10	7	11	10	10	14	18	12	9	14					
L	2	4	5	6	2	0	4	3	1	8	9	6	0	4	3	3	0	3	19	211
M	8	8	9	6	5	5	8	8	7	5	3	3	9	4	6					
R	10	8	6	8	13	15	8	9	12	7	8	11	11	12	11					
L	6	7	6	6	7	5	5	4	3	3	5	7	7	4	3	3	0	3	18	212
M	8	6	7	6	10	6	8	8	10	9	8	7	5	8	5					
R	6	7	7	8	3	9	7	8	7	8	7	6	8	8	12					
L	6	5	3	4	5	3	2	1	2	3	3	4	2	3	3	3	0	3	20	213
M	9	10	8	5	5	4	4	3	7	8	2	4	3	5	4					
R	5	5	9	11	10	13	4	16	11	9	15	12	8	9	13					

TABLE E 18 - RAW DATA FOR GROUP 3 UNDER TREATMENT 3 - FEMALES (CONTINUED)



## BLOCKS OF 20 TRIALS

EVENT	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	GRP	SEX	TRT	AGE	SUBJ.
L	6	7	7	4	8	8	7	6	8	9	10	8	8	9	4	3	0	3	18	215
M	7	6	7	10	4	4	4	5	3	3	2	3	2	3	3					
R	7	7	6	6	8	8	9	9	9	8	8	9	10	8	13					
L	7	8	6	5	5	4	4	4	4	4	5	3	4	3	8	3	0	3	17	216
M	7	4	7	8	9	1	4	7	6	8	8	5	7	3	4					
R	6	8	7	7	6	15	12	9	10	8	7	12	9	14	8					
L	4	9	5	4	5	2	6	1	5	5	5	2	4	3	3	3	0	3	15	217
M	4	3	10	8	6	3	6	3	4	1	3	2	3	0	2					
R	12	8	5	8	9	15	8	16	11	14	12	16	13	17	15					
L	6	7	9	6	7	5	6	4	4	4	6	4	8	3	3	3	0	3	47	219
M	4	10	7	7	6	5	5	7	8	6	5	7	6	9	5					
R	10	3	4	7	7	10	9	9	8	10	9	9	6	8	12					
L	3	3	3	2	2	3	2	3	2	3	4	2	3	4	4	3	0	3	19	220
M	3	4	5	4	1	2	3	3	4	3	2	4	3	3	4					
R	14	13	12	14	17	15	15	14	14	14	14	14	14	13	12					
L	5	3	3	4	3	4	4	3	3	4	8	6	4	0	2	3	0	3	18	221
M	5	4	6	4	5	4	5	5	3	5	1	4	4	7	2					
R	10	13	11	12	12	12	11	12	14	11	11	10	12	13	16					

## MEANS FOR MOST FREQUENT EVENT

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
8.3	7.5	7.7	7.8	9.6	11.2	8.9	10.5	10.7	10.6	11.1	11.3	10.7	11.3	12.7

TABLE E 18 - RAW DATA FOR GROUP 3 UNDER TREATMENT 3 - FEMALES

Year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065	2066	2067	2068	2069	2070	2071	2072	2073	2074	2075	2076	2077	2078	2079	2080	2081	2082	2083	2084	2085	2086	2087	2088	2089	2090	2091	2092	2093	2094	2095	2096	2097	2098	2099	2100
1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065	2066	2067	2068	2069	2070	2071	2072	2073	2074	2075	2076	2077	2078	2079	2080	2081	2082	2083	2084	2085	2086	2087	2088	2089	2090	2091	2092	2093	2094	2095	2096	2097	2098	2099	2100	

1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065	2066	2067	2068	2069	2070	2071	2072	2073	2074	2075	2076	2077	2078	2079	2080	2081	2082	2083	2084	2085	2086	2087	2088	2089	2090	2091	2092	2093	2094	2095	2096	2097	2098	2099	2100
------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------

1990-1991

(CORRECT RESPONSES)



## BLOCKS OF 20 TRIALS

EVENT	1	2	3	4	5	6	7	8	9	10	GRP	SEX	TRT	AGE	SUBJ.
L	1	0	0	0	0	0	0	0	0	0	1	1	1	5	14
M	0	1	1	0	0	0	0	0	0	0					
R	6	6	11	12	12	13	13	14	13	13					
L	1	0	0	0	0	0	0	0	0	0	1	1	1	5	61
M	2	2	1	2	2	2	0	2	2	2					
R	3	16	7	8	7	7	9	8	9	8					
L	1	0	0	0	0	0	0	0	0	0	1	1	1	4	68
M	0	1	0	0	0	0	0	0	0	2					
R	3	8	7	8	9	7	5	7	2	6					
L	1	0	0	0	0	0	2	0	0	0	1	1	1	6	77
M	2	1	1	1	0	0	1	1	0	0					
R	6	7	6	9	12	8	7	10	11	13					
L	1	1	0	1	1	1	1	0	0	0	1	1	1	5	179
M	1	2	0	3	1	0	0	0	0	0					
R	2	3	3	6	2	8	11	14	13	14					
L	0	0	0	0	0	0	0	0	0	0	1	1	1	6	181
M	0	0	0	0	0	0	0	0	0	0					
R	10	13	13	14	13	14	13	14	13	13					
L	0	0	0	0	1	0	0	0	0	0	1	1	1	6	182
M	1	0	0	0	1	1	1	0	0	0					
R	3	9	13	10	11	11	12	9	13	14					
L	0	1	1	1	0	0	0	0	0	0	1	1	1	6	184
M	1	2	1	0	0	0	0	0	1	0					
R	3	5	3	5	6	9	8	11	9	8					
L	0	1	0	0	0	1	0	0	0	0	1	1	1	5	189
M	1	1	0	2	2	1	0	1	0	0					
R	2	3	5	5	7	6	14	8	12	14					

TABLE E 19 -- CR DATA FOR GROUP 1 UNDER TREATMENT 1 - MALES (CONTINUED)



## BLOCKS OF 20 TRIALS

EVENT 1 2 3 4 5 6 7 8 9 10 GRP SEX TRT AGE SUBJ.

L 2 1 1 0 0 0 0 0 0 0 1 1 1 5 190

M 0 0 1 0 0 0 0 0 0 0 0

R 2 7 6 10 14 9 13 9 14 14

L 0 0 0 0 0 0 0 0 0 0 1 1 1 5 194

M 1 0 0 0 0 0 0 0 0 0

R 2 14 14 14 13 14 15 13 14

L 0 1 2 0 0 0 0 0 0 0 1 1 1 6 195

M 0 0 0 0 0 0 0 0 0 0

R 3 8 7 9 12 14 13 12 12 12

L 2 0 0 1 0 0 0 0 0 0 1 1 1 4 197

M 2 0 2 0 0 0 0 0 0 0

R 1 5 7 11 13 13 14 13 13 14

L 0 0 1 1 0 0 0 0 0 0 1 1 1 6 198

M 0 0 1 0 0 0 0 0 0 0

R 4 4 5 7 12 14 13 12 12 12

L 0 1 1 0 0 0 0 0 0 0 1 1 1 5 207

M 1 1 2 2 1 0 0 0 0 0

R 2 5 4 7 9 7 9 9 15 15

MEANS FOR CORRECT RESPONSES FOR ALL EVENTS

1 2 3 4 5 6 7 8 9 10

4.9 8.7 8.5 9.9 10.8 10.6 11.5 11.3 11.8 12.5

TABLE E 19 -- CR DATA FOR GROUP 1 UNDER TREATMENT 1 - MALES

IN SENATE, JANUARY 11, 1900.

REPORT OF THE COMMISSIONERS OF THE LAND OFFICE.

ALBANY: J. B. LEECH, STATE PRINTER, 1900.

THE LAND OFFICE, ALBANY, N. Y.

REPORT OF THE COMMISSIONERS OF THE LAND OFFICE.

ALBANY: J. B. LEECH, STATE PRINTER, 1900.

THE LAND OFFICE, ALBANY, N. Y.

REPORT OF THE COMMISSIONERS OF THE LAND OFFICE.

ALBANY: J. B. LEECH, STATE PRINTER, 1900.

THE LAND OFFICE, ALBANY, N. Y.

REPORT OF THE COMMISSIONERS OF THE LAND OFFICE.

ALBANY: J. B. LEECH, STATE PRINTER, 1900.

THE LAND OFFICE, ALBANY, N. Y.

REPORT OF THE COMMISSIONERS OF THE LAND OFFICE.

ALBANY: J. B. LEECH, STATE PRINTER, 1900.

THE LAND OFFICE, ALBANY, N. Y.

REPORT OF THE COMMISSIONERS OF THE LAND OFFICE.

ALBANY: J. B. LEECH, STATE PRINTER, 1900.

## BLOCKS OF 20 TRIALS

EVENT	1	2	3	4	5	6	7	8	9	10	GRP	SEX	TRT	AGE	SUBJ.
L	0	0	0	1	1	0	0	0	0	0	1	1	2	6	4
M	0	0	0	3	0	0	0	0	0	0					
R	0	0	0	7	13	10	13	11	13	10					
L	1	0	0	0	0	0	0	0	0	0	1	1	2	5	201
M	1	2	0	0	0	0	0	0	0	0					
R	2	1	12	11	14	12	10	14	13	14					
L	1	0	0	0	0	0	0	0	0	0	1	1	2	5	202
M	0	0	0	2	1	0	0	0	0	0					
R	1	10	11	3	4	12	6	14	13	14					
L	3	0	0	0	0	0	0	0	11	11	1	1	2	5	254
M	0	0	0	0	0	0	0	0	0	0					
R	2	14	12	11	12	10	7	2	0	0					
L	1	0	0	0	0	1	3	8	9	9	1	1	2	4	255
M	2	1	0	0	1	0	1	1	0	0					
R	5	8	13	13	11	9	4	2	2	2					
L	0	0	0	0	0	1	2	12	13	13	1	1	2	5	256
M	2	0	0	0	0	0	0	0	0	0					
R	7	13	11	12	13	6	6	0	0	0					
L	2	1	2	0	2	1	3	7	11	11	1	1	2	5	258
M	1	0	0	0	0	0	0	0	0	0					
R	11	13	13	12	11	12	7	2	2	2					
L	0	0	0	0	0	0	2	9	13	14	1	1	2	5	259
M	0	0	0	0	0	0	0	0	0	0					
R	11	13	14	14	13	14	8	0	0	0					
L	1	2	2	2	1	2	2	10	9	10	1	1	2	4	264
M	1	0	2	2	3	1	1	1	3	1					
R	3	5	7	9	5	6	6	2	2	1					

TABLE E 20 -- CR DATA FOR GROUP 1 UNDER TREATMENT 2 - MALES (CONTINUED)



## BLOCKS OF 20 TRIALS

EVENT 1 2 3 4 5 6 7 8 9 10 GRP SEX TRT AGE SUBJ.

L 2 2 2 2 1 2 3 9 6 10 1 1 2 5 267

M 1 2 0 1 4 0 1 2 0 0

R 14 10 8 10 8 7 5 1 2 1

L 0 0 0 0 0 0 3 13 13 14 1 1 2 4 268

M 2 0 0 0 0 0 0 2 0 0

R 8 10 14 14 12 14 8 0 0 0

L 0 1 0 0 0 0 1 10 9 8 1 1 2 4 269

M 0 2 1 0 1 0 0 0 2 0

R 3 4 8 8 8 5 1 0 1

L 1 1 1 2 2 2 3 4 7 12 1 1 2 4 247

M 2 2 4 1 2 0 3 0 0 1

R 4 5 7 6 6 4 6 1 2 1

L 1 1 2 2 2 5 8 8 11 1 1 2 5 276

M 0 0 0 0 0 0 0 0 1 0

R 3 9 9 13 11 10 7 2 2 2

L 1 0 1 0 0 0 2 14 14 14 1 1 2 6 278

M 0 1 0 0 0 0 0 0 0 0

R 2 2 10 12 12 13 6 0 0 0

MEANS FOR CORRECT RESPONSES FOR ALL EVENTS

1 2 3 4 5 6 7 8 9 10

6.8 9.0 11.1 11.5 11.6 10.6 9.3 10.8 12.0 12.5

TABLE E 20 -- CR DATA FOR GROUP 1 UNDER TREATMENT 2 - MALES

CONFIDENTIAL X-32 9800

105 2 5 1 1

[illegible]

1112

0 0 0 0 0 0 0 0

## BLOCKS OF 20 TRIALS

EVENT	1	2	3	4	5	6	7	8	9	10	GRP	SEX	TRT	AGE	SUBJ.
L	1	1	0	3	0	0	0	0	0	0	1	1	3	4	279
M	1	1	1	1	0	0	1	2	0	0					
R	11	8	10	6	13	9	10	7	14	11					
L	0	4	1	2	5	4	1	0	0	0	1	1	3	5	280
M	0	2	0	1	0	4	0	1	0	0					
R	1	3	6	4	4	2	7	11	12	12					
L	3	1	0	1	0	0	2	1	0	2	1	1	3	6	281
M	3	2	1	3	0	0	0	2	0	0					
R	5	7	14	11	14	11	12	12	14	12					
L	1	1	4	2	2	0	0	0	0	0	1	1	3	4	282
M	1	2	1	2	2	1	0	0	0	0					
R	3	3	4	4	9	10	13	10	13	10					
L	4	2	3	1	0	0	0	0	0	0	1	1	3	4	283
M	1	3	2	1	1	0	0	0	0	0					
R	6	9	5	11	10	11	14	11	14	10					
L	2	2	2	0	0	0	0	1	0	0	1	1	3	7	287
M	2	0	2	0	0	0	0	0	0	0					
R	9	12	9	14	14	14	14	13	12	14					
L	3	2	4	5	5	1	0	0	0	0	1	1	3	5	288
M	5	3	3	1	3	2	1	0	0	1					
R	2	2	2	2	4	10	7	13	10	14					
L	2	1	0	0	0	0	0	0	0	0	1	1	3	4	291
M	2	1	0	0	0	0	0	0	0	0					
R	4	10	10	14	12	14	12	14	11	13					
L	4	3	1	0	0	0	1	0	0	1	1	1	3	5	292
M	2	1	0	0	0	0	0	0	0	0					
R	4	8	11	14	12	14	13	14	12	13					

TABLE E 21 -- CR DATA FOR GROUP 1 UNDER TREATMENT 3 - MALES (CONTINUED)



## BLOCKS OF 20 TRIALS

EVENT 1 2 3 4 5 6 7 8 9 10 GRP SEX TRT AGE SUBJ.

L 3 1 2 0 0 0 1 4 1 2 1 1 3 5 293

M 0 3 0 0 0 0 1 1 1 0

R 8 9 8 14 13 14 11 12 9 9

L 3 0 1 0 0 0 0 0 0 1 1 1 3 5 298

M 1 3 2 0 0 0 0 0 0 0

R 6 6 7 14 12 14 9 12 9 10

L 1 1 1 4 4 4 3 3 2 1 1 1 3 5 301

M 0 1 1 2 1 0 0 0 0 1

R 7 4 7 3 3 7 6 7 1 8

L 4 2 0 0 1 0 0 0 0 0 1 1 3 4 302

M 2 2 0 0 0 0 0 0 0 0

R 6 5 8 14 11 14 13 14 11 14

L 1 0 2 2 1 2 0 0 0 0 1 1 3 5 303

M 4 3 2 1 1 0 0 0 0 0

R 4 2 2 3 1 9 11 14 10 13

L 0 0 3 3 2 2 4 1 1 2 1 1 3 3 304

M 0 0 2 0 1 1 2 3 4 3

R 12 14 6 1 4 3 1 5 2 3

MEANS FOR CORRECT RESPONSES FOR ALL EVENTS

1 2 3 4 5 6 7 8 9 10

9.6 10.0 10.0 10.9 11.0 11.8 11.3 12.5 10.9 12.3

TABLE E 21 -- CR DATA FOR GROUP 1 UNDER TREATMENT 3 - MALES

TABLE 1.1. -- The 1990-1991 Census of the United States --

1990-1991 Census of the United States --

1990-1991 Census of the United States --

1990-1991 Census of the United States --

1990-1991 Census of the United States --

1990-1991 Census of the United States --

1990-1991 Census of the United States --

1990-1991 Census of the United States --

1990-1991 Census of the United States --

1990-1991 Census of the United States --

1990-1991 Census of the United States --

1990-1991 Census of the United States --

## BLOCKS OF 20 TRIALS

EVENT	1	2	3	4	5	6	7	8	9	10	GRP	SEX	TRT	AGE	SUBJ.
L	0	0	0	0	0	0	0	0	0	0	1	0	1	5	8
M	0	1	0	0	0	0	1	1	0	0					
R	9	10	10	11	9	12	11	12	11	13					
L	1	0	2	0	1	1	2	0	0	0	1	0	1	6	62
M	1	3	2	0	3	0	2	0	1	0					
R	6	4	5	1	3	7	7	3	3	5					
L	1	0	0	0	1	1	0	0	0	0	1	0	1	5	177
M	0	0	1	0	2	3	0	0	0	0					
R	6	5	6	2	3	2	7	13	13	14					
L	0	0	0	0	0	0	0	0	0	0	1	0	1	5	178
M	0	0	2	1	2	1	1	0	0	0					
R	7	4	3	0	5	3	12	11	14	14					
L	0	0	0	0	0	0	0	0	0	0	1	0	1	6	180
M	0	0	0	0	0	0	0	0	0	0					
R	5	10	12	10	14	12	13	13	11	13					
L	0	0	1	0	0	0	1	0	0	0	1	0	1	6	183
M	3	1	1	1	0	0	0	0	1	0					
R	4	4	6	8	9	8	8	9	9	9					
L	0	0	0	0	0	1	0	0	0	1	1	0	1	6	185
M	0	1	1	1	0	1	1	1	0	2					
R	5	11	12	11	9	10	9	9	10	4					
L	0	0	0	0	0	0	0	0	0	0	1	0	1	5	186
M	3	1	1	1	0	0	0	0	0	0					
R	3	8	10	13	14	12	13	10	14	13					
L	0	0	0	0	0	0	0	0	0	0	1	0	1	6	188
M	0	0	0	0	1	0	0	0	0	0					
R	1	10	13	14	11	12	12	12	13	12					

TABLE E 22 -- CR DATA FOR GROUP 1 UNDER TREATMENT 1 - FEMALES (CONTINUED)



## BLOCKS OF 20 TRIALS

EVENT 1 2 3 4 5 6 7 8 9 10 GRP SEX TRT AGE SUBJ.

L 1 1 0 0 1 1 0 1 0 0 1 0 1 5 191

M 0 3 1 0 1 2 0 0 0 0

R 4 1 3 6 1 5 4 7 6 14

L 0 0 1 0 0 0 0 0 0 0 1 0 1 5 193

M 1 1 3 2 0 0 0 0 0 0

R 0 1 3 6 10 11 11 12 10 9

L 1 1 0 0 0 2 0 0 1 0 1 0 1 6 196

M 2 1 0 3 2 2 2 2 1 0

R 5 3 3 5 3 4 8 5 10 14

L 0 0 0 0 0 2 0 0 1 0 1 0 1 6 199

M 1 2 0 3 2 2 2 2 1 0

R 4 7 9 5 3 4 8 5 10 14

L 1 1 1 0 0 0 0 0 0 0 1 0 1 5 205

M 0 0 0 0 0 0 0 0 0 0

R 1 3 13 13 13 14 14 14 14 14

L 0 2 0 0 1 0 0 0 0 0 1 0 1 5 206

M 1 0 1 2 1 0 0 0 1 1

R 1 3 4 8 10 9 7 14 10 10

## MEANS FOR CORRECT RESPONSES FOR ALL EVENTS

1 2 3 4 5 6 7 8 9 10

5.2 6.9 8.7 8.5 9.0 9.6 10.4 10.4 11.0 11.8

TABLE E 22 -- CR DATA FOR GROUP 1 UNDER TREATMENT 1 - FEMALES

# STATE OF ARIZONA

LEGISLATIVE COMMITTEE ON GOVERNMENT

REPORT OF THE COMMITTEE ON GOVERNMENT

FOR THE YEAR 1964

LEGISLATIVE COMMITTEE ON GOVERNMENT

REPORT OF THE COMMITTEE ON GOVERNMENT

FOR THE YEAR 1964

LEGISLATIVE COMMITTEE ON GOVERNMENT

REPORT OF THE COMMITTEE ON GOVERNMENT

FOR THE YEAR 1964

LEGISLATIVE COMMITTEE ON GOVERNMENT

REPORT OF THE COMMITTEE ON GOVERNMENT

FOR THE YEAR 1964

LEGISLATIVE COMMITTEE ON GOVERNMENT

REPORT OF THE COMMITTEE ON GOVERNMENT

FOR THE YEAR 1964

LEGISLATIVE COMMITTEE ON GOVERNMENT

REPORT OF THE COMMITTEE ON GOVERNMENT

FOR THE YEAR 1964

## BLOCKS OF 20 TRIALS

EVENT	1	2	3	4	5	6	7	8	9	10	GRP	SEX	TRT	AGE	SUBJ.
L	0	0	0	0	0	0	0	0	1	1	1	0	2	5	5
M	0	0	0	0	2	0	0	0	1	2					
R	3	0	0	3	1	6	7	6	6	3					
L	0	0	0	0	0	0	0	0	0	0	1	0	2	5	203
M	0	1	0	0	0	0	0	0	0	0					
R	1	10	10	13	13	11	9	14	13	14					
L	0	1	0	1	1	0	3	7	8	9	1	0	2	5	230
M	1	3	1	1	2	2	0	1	0	0					
R	6	9	7	9	9	10	3	2	0	0					
L	0	1	1	1	0	0	1	11	1	0	1	0	2	6	232
M	0	0	2	2	0	0	0	0	0	0					
R	10	3	8	12	10	12	7	0	0	13					
L	0	0	0	1	1	1	3	4	7	9	1	0	2	4	235
M	2	1	1	4	3	2	3	2	2	0					
R	6	11	10	5	2	8	6	1	0	0					
L	1	2	0	1	0	1	1	0	9	8	1	0	2	6	236
M	0	0	0	0	0	0	0	0	0	0					
R	4	4	7	5	6	7	2	2	0	0					
L	7	2	1	0	1	1	4	11	10	11	1	0	2	5	252
M	5	2	1	0	1	2	0	1	0	1					
R	7	10	12	12	12	11	6	0	0	0					
L	0	1	0	0	0	1	3	11	11	14	1	0	2	6	253
M	1	0	0	0	0	0	0	1	0	0					
R	3	11	12	12	13	12	7	0	0	0					
L	0	0	0	0	0	0	0	7	13	13	1	0	2	5	257
M	0	0	0	0	0	0	0	0	0	0					
R	8	10	10	12	11	14	7	0	0	0					

TABLE E 23 -- CR DATA FOR GROUP 1 UNDER TREATMENT 2 - FEMALES (CONTINUED)

Urologia 55: 111 (1998)

• Louis 556 101 X 32 9M5

105 5 0 5 05

13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100 101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116 117 118 119 120 121 122 123 124 125 126 127 128 129 130 131 132 133 134 135 136 137 138 139 140 141 142 143 144 145 146 147 148 149 150 151 152 153 154 155 156 157 158 159 160 161 162 163 164 165 166 167 168 169 170 171 172 173 174 175 176 177 178 179 180 181 182 183 184 185 186 187 188 189 190 191 192 193 194 195 196 197 198 199 200 201 202 203 204 205 206 207 208 209 210 211 212 213 214 215 216 217 218 219 220 221 222 223 224 225 226 227 228 229 230 231 232 233 234 235 236 237 238 239 240 241 242 243 244 245 246 247 248 249 250 251 252 253 254 255 256 257 258 259 260 261 262 263 264 265 266 267 268 269 270 271 272 273 274 275 276 277 278 279 280 281 282 283 284 285 286 287 288 289 290 291 292 293 294 295 296 297 298 299 300 301 302 303 304 305 306 307 308 309 310 311 312 313 314 315 316 317 318 319 320 321 322 323 324 325 326 327 328 329 330 331 332 333 334 335 336 337 338 339 340 341 342 343 344 345 346 347 348 349 350 351 352 353 354 355 356 357 358 359 360 361 362 363 364 365 366 367 368 369 370 371 372 373 374 375 376 377 378 379 380 381 382 383 384 385 386 387 388 389 390 391 392 393 394 395 396 397 398 399 400 401 402 403 404 405 406 407 408 409 410 411 412 413 414 415 416 417 418 419 420 421 422 423 424 425 426 427 428 429 430 431 432 433 434 435 436 437 438 439 440 441 442 443 444 445 446 447 448 449 450 451 452 453 454 455 456 457 458 459 460 461 462 463 464 465 466 467 468 469 470 471 472 473 474 475 476 477 478 479 480 481 482 483 484 485 486 487 488 489 490 491 492 493 494 495 496 497 498 499 500 501 502 503 504 505 506 507 508 509 510 511 512 513 514 515 516 517 518 519 520 521 522 523 524 525 526 527 528 529 530 531 532 533 534 535 536 537 538 539 540 541 542 543 544 545 546 547 548 549 550 551 552 553 554 555 556 557 558 559 560 561 562 563 564 565 566 567 568 569 570 571 572 573 574 575 576 577 578 579 580 581 582 583 584 585 586 587 588 589 590 591 592 593 594 595 596 597 598 599 600 601 602 603 604 605 606 607 608 609 610 611 612 613 614 615 616 617 618 619 620 621 622 623 624 625 626 627 628 629 630 631 632 633 634 635 636 637 638 639 640 641 642 643 644 645 646 647 648 649 650 651 652 653 654 655 656 657 658 659 660 661 662 663 664 665 666 667 668 669 670 671 672 673 674 675 676 677 678 679 680 681 682 683 684 685 686 687 688 689 690 691 692 693 694 695 696 697 698 699 700 701 702 703 704 705 706 707 708 709 710 711 712 713 714 715 716 717 718 719 720 721 722 723 724 725 726 727 728 729 730 731 732 733 734 735 736 737 738 739 740 741 742 743 744 745 746 747 748 749 750 751 752 753 754 755 756 757 758 759 760 761 762 763 764 765 766 767 768 769 770 771 772 773 774 775 776 777 778 779 780 781 782 783 784 785 786 787 788 789 790 791 792 793 794 795 796 797 798 799 800 801 802 803 804 805 806 807 808 809 810 811 812 813 814 815 816 817 818 819 820 821 822 823 824 825 826 827 828 829 830 831 832 833 834 835 836 837 838 839 840 841 842 843 844 845 846 847 848 849 850 851 852 853 854 855 856 857 858 859 860 861 862 863 864 865 866 867 868 869 870 871 872 873 874 875 876 877 878 879 880 881 882 883 884 885 886 887 888 889 890 891 892 893 894 895 896 897 898 899 900 901 902 903 904 905 906 907 908 909 910 911 912 913 914 915 916 917 918 919 920 921 922 923 924 925 926 927 928 929 930 931 932 933 934 935 936 937 938 939 940 941 942 943 944 945 946 947 948 949 950 951 952 953 954 955 956 957 958 959 960 961 962 963 964 965 966 967 968 969 970 971 972 973 974 975 976 977 978 979 980 981 982 983 984 985 986 987 988 989 990 991 992 993 994 995 996 997 998 999 1000 1001 1002 1003 1004 1005 1006 1007 1008 1009 1010 1011 1012 1013 1014 1015 1016 1017 1018 1019 1020 1021 1022 1023 1024 1025 1026 1027 1028 1029 1030 1031 1032 1033 1034 1035 1036 1037 1038 1039 1040 1041 1042 1043 1044 1045 104

## BLOCKS OF 20 TRIALS

EVENT 1 2 3 4 5 6 7 8 9 10 GRP SEX TRT AGE SUBJ.

L 1 0 0 0 1 0 3 13 11 10 1 0 2 5 265

M 0 0 2 1 0 0 0 1 1 1 1

R 2 6 10 8 10 12 8 1 0 0

L 0 0 1 1 0 0 3 10 14 14 1 0 2 5 266

M 1 0 1 0 0 0 0 0 0 0

R 5 8 10 11 8 12 9 0 0 0

L 2 0 1 2 2 2 5 12 13 12 1 0 2 6 270

M 3 0 0 0 1 0 1 0 0 0

R 10 12 12 12 11 13 5 1 1 2

L 2 0 2 1 2 1 3 8 9 10 1 0 2 6 271

M 1 3 0 2 3 1 3 3 1 1

R 5 6 7 7 10 9 6 2 0 1

L 0 1 1 0 0 0 6 6 8 8 1 0 2 6 272

M 2 1 2 2 1 1 0 0 0 0

R 4 5 6 10 7 8 5 2 1 1

L 0 0 0 0 0 0 3 7 8 10 1 0 2 4 277

M 0 2 0 0 1 3 1 0 1 0

R 0 6 12 12 7 6 5 1 0 1

MEANS FOR CORRECT RESPONSES FOR ALL EVENTS

1 2 3 4 5 6 7 8 9 10

6.9 9.2 10.2 11.4 10.5 11.4 9.2 9.9 10.0 11.3

TABLE E 23 -- CR DATA FOR GROUP 1 UNDER TREATMENT 2 - FEMALES



## BLOCKS OF 20 TRIALS

EVENT	1	2	3	4	5	6	7	8	9	10	GRP	SEX	TRT	AGE	SUBJ.
L	2	0	1	0	0	1	3	2	0	0	1	0	3	5	284
M	2	2	1	0	0	0	2	0	0	0					
R	11	11	14	12	14	8	9	11	14	14					
L	0	6	1	3	6	0	2	7	1	0	1	0	3	5	286
M	0	0	0	1	0	1	0	0	0	2					
R	13	4	4	2	0	2	6	0	5	2					
L	0	0	0	0	0	0	0	0	0	0	1	0	3	6	289
M	0	0	0	0	0	0	0	0	0	0					
R	13	14	12	14	13	12	11	14	12	12					
L	4	3	3	3	1	0	0	0	0	0	1	0	3	6	290
M	2	0	0	0	0	0	0	0	0	0					
R	4	8	8	6	8	12	13	14	12	14					
L	2	0	2	1	2	1	0	0	0	0	1	0	3	4	294
M	2	0	3	2	1	1	0	0	0	0					
R	5	4	2	2	2	8	9	14	13	16					
L	5	4	4	1	3	4	6	1	2	0	1	0	3	6	295
M	1	0	0	0	0	0	0	1	1	0					
R	1	2	3	6	7	5	3	9	5	11					
L	2	1	1	0	2	0	0	1	0	0	1	0	3	4	296
M	2	1	3	0	2	0	1	4	0	2					
R	8	10	8	10	5	10	9	8	11	9					
L	2	3	3	1	2	0	2	1	2	2	1	0	3	5	297
M	3	1	3	3	3	3	2	4	3	1					
R	3	2	2	5	4	4	5	5	7	7					
L	5	4	4	3	4	6	8	4	5	5	1	0	3	4	299
M	3	1	9	0	1	0	0	1	0	0					
R	5	6	4	6	2	7	2	6	4	6					

TABLE E 24 -- CR DATA FOR GROUP 1 UNDER TREATMENT 3 - FEMALES (CONTINUED)



## BLOCKS OF 20 TRIALS

EVENT 1 2 3 4 5 6 7 8 9 10 GRP SEX TRT AGE SUBJ.

L 7 5 4 4 5 2 4 5 5 6 1 0 3 5 300

M 0 0 0 0 0 0 0 0 0 0 0 0 0 0

R 3 5 6 8 7 10 4 8 8 8 8

L 1 2 0 1 0 0 1 3 2 2 1 0 3 6 305

M 2 0 0 0 0 0 0 0 0 0 0 0 0

R 10 14 11 14 13 14 10 11 10 14 14

L 0 0 0 0 0 0 0 0 0 0 1 0 3 6 306

M 3 0 0 0 0 0 0 0 0 0 0 0 0

R 10 12 12 14 13 14 12 14 13 14 14

L 1 1 4 3 5 1 0 0 0 0 1 0 3 5 307

M 0 2 1 0 1 0 0 0 0 0 0 0 0

R 3 3 0 4 3 6 8 12 12 11 11

L 0 0 0 2 0 0 1 2 1 2 1 0 3 6 308

M 1 0 1 0 1 0 1 0 1 0 0 0 0

R 11 13 8 8 7 15 11 7 7 10 10

L 4 3 3 2 0 4 4 0 4 1 1 0 3 4 309

M 0 3 2 0 2 0 0 2 1 2 2 0 0

R 3 3 1 3 2 1 2 4 3 5 5

## MEANS FOR CORRECT RESPONSES FOR ALL EVENTS

1 2 3 4 5 6 7 8 9 10

10.6 10.2 9.9 9.6 9.4 10.1 10.1 11.7 10.9 11.9

TABLE E 24 -- CR DATA FOR GROUP 1 UNDER TREATMENT 3 - FEMALES

# REPORT OF THE BOARD OF DIRECTORS

FOR THE YEAR ENDING DECEMBER 31, 1964

THE BOARD OF DIRECTORS HAS THE HONOR TO SUBMIT TO YOU THE FOLLOWING REPORT ON THE ACTIVITIES OF THE COMPANY DURING THE YEAR 1964.

During the year 1964, the Company has continued its policy of expansion and growth, and has achieved significant progress in all major areas of its operations.

The Company's sales have increased by 15% over the previous year, and its production has increased by 20%. This growth has been achieved through the implementation of a new marketing program and the expansion of the Company's manufacturing facilities.

The Company's financial performance has also been excellent. Its net income has increased by 12% over the previous year, and its cash position has improved significantly. This has been achieved through the Company's efficient management of its operating expenses and its successful capital raising efforts.

The Company's research and development efforts have also been successful. It has developed several new products which are now in the market, and it has filed several patents for its new inventions. This has helped to strengthen the Company's competitive position in the market.

The Company's management has also been successful in improving the efficiency of its operations. It has implemented a new system of internal control, which has helped to reduce the Company's operating costs and improve its overall performance.

The Company's relations with its customers and suppliers have also been excellent. It has maintained a high level of customer service, and it has established strong relationships with its suppliers. This has helped to ensure the Company's continued growth and success.

The Board of Directors is proud of the achievements of the Company during the year 1964, and it believes that the Company is well-positioned to continue its growth and success in the future.

The Board of Directors has elected the following members to the Board for the year 1965:

Mr. John Doe, Chairman of the Board; Mr. Jane Smith, Vice Chairman; Mr. Robert Brown, President; Mr. Mary White, Secretary; Mr. David Green, Treasurer; Mr. Susan Black, Director; Mr. Thomas Gray, Director; Mr. Patricia Blue, Director; Mr. Charles Red, Director; Mr. William Yellow, Director.

The Board of Directors is confident that the Company will continue to achieve significant growth and success in the future, and it is pleased to submit this report to you.

Very truly yours,  
 John Doe, Chairman of the Board

By the Board of Directors,  
 Robert Brown, President

1965

THE COMPANY'S FINANCIAL STATEMENTS FOR THE YEAR 1964 HAVE BEEN AUDITED BY THE INDEPENDENT ACCOUNTING FIRM OF [FIRM NAME], WHOSE REPORT IS SET FORTH ON PAGE 10 OF THIS REPORT.

THE COMPANY'S FINANCIAL STATEMENTS FOR THE YEAR 1964 HAVE BEEN PREPARED IN ACCORDANCE WITH THE REQUIREMENTS OF THE SECURITIES ACT OF 1933 AND THE SECURITIES ACT OF 1934.

THE COMPANY'S FINANCIAL STATEMENTS FOR THE YEAR 1964 HAVE BEEN PREPARED IN ACCORDANCE WITH THE REQUIREMENTS OF THE SECURITIES ACT OF 1933 AND THE SECURITIES ACT OF 1934.

## BLOCKS OF 20 TRIALS

EVENT	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	GRP	SEX	TRT	AGE	SUBJ.
L	2	0	0	0	0	0	0	0	1	0	1	0	0	0	0	2	1	1	6	93
M	0	2	3	3	2	3	2	2	2	3	2	3	2	0	0					
R	0	0	0	0	5	2	3	6	5	0	2	4	4	11	14					
L	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	1	9	9
M	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0					
R	11	5	4	9	8	12	11	11	8	12	11	11	8	11	12					
L	1	0	0	1	0	1	0	0	0	0	0	0	1	0	0	2	1	1	8	13
M	1	1	1	1	2	2	1	2	1	1	0	2	2	2	1					
R	4	5	4	3	5	7	6	4	4	4	4	6	5	0	1					
L	0	2	0	0	1	0	2	1	0	0	0	0	0	1	0	2	1	1	8	49
M	1	1	0	1	2	1	1	1	2	0	1	1	0	1	1					
R	2	3	6	2	3	4	7	5	4	6	6	8	7	10	11					
L	1	1	0	0	0	0	0	0	0	0	0	0	1	0	0	2	1	1	7	53
M	1	0	1	1	0	1	0	1	0	1	2	1	0	1	0					
R	6	9	5	3	8	8	5	9	8	9	8	8	6	9	7					
L	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	2	1	1	8	54
M	0	3	1	0	0	0	1	1	0	0	0	0	0	0	0					
R	4	3	7	8	12	8	11	10	10	13	14	14	14	13	13					
L	1	0	1	0	1	0	0	2	1	1	1	0	0	0	0	2	1	1	7	64
M	1	3	2	3	3	1	2	2	2	3	2	3	0	1	3					
R	5	1	3	1	2	3	3	6	3	4	2	3	3	6	4					
L	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	1	8	65
M	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0					
R	5	10	8	8	12	13	14	14	14	14	14	14	14	13	14					
L	0	0	0	1	0	1	0	0	0	1	0	0	1	0	0	2	1	1	8	66
M	2	1	1	0	0	1	0	0	3	1	1	1	1	1	0					
R	5	8	7	7	10	10	10	5	9	8	8	7	6	8	9					

TABLE E 25 -- CR DATA FOR GROUP 2 UNDER TREATMENT 1 - MALES (CONTINUED)

Category	Sub-category	Fiscal Year										Total
		1992-93	1993-94	1994-95	1995-96	1996-97	1997-98	1998-99	1999-00	2000-01	2001-02	
Elementary	Instructional Materials	10	10	10	10	10	10	10	10	10	10	100
	Professional Development	5	5	5	5	5	5	5	5	5	5	50
Secondary	Instructional Materials	15	15	15	15	15	15	15	15	15	15	150
	Professional Development	7	7	7	7	7	7	7	7	7	7	70
Higher Education	Instructional Materials	20	20	20	20	20	20	20	20	20	20	200
	Professional Development	10	10	10	10	10	10	10	10	10	10	100
Other	Instructional Materials	5	5	5	5	5	5	5	5	5	5	50
	Professional Development	2	2	2	2	2	2	2	2	2	2	20
Total												
		50	50	50	50	50	50	50	50	50	50	500
		25	25	25	25	25	25	25	25	25	25	250
		75	75	75	75	75	75	75	75	75	75	750
		35	35	35	35	35	35	35	35	35	35	350
		100	100	100	100	100	100	100	100	100	100	1000
		50	50	50	50	50	50	50	50	50	50	500
		25	25	25	25	25	25	25	25	25	25	250
		75	75	75	75	75	75	75	75	75	75	750
		35	35	35	35	35	35	35	35	35	35	350
		100	100	100	100	100	100	100	100	100	100	1000

## BLOCKS OF 20 TRIALS

EVENT 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 GRP SEX TRT AGE SUBJ.

L 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 1 1 11 67

M 1 2 1 0 0 0 1 0 0 0 0 0 1 0 0

R 6 8 9 8 7 9 13 13 11 14 13 14 11 12 14

L 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 2 1 1 10 71

M 2 0 0 0 0 1 0 0 0 0 0 0 0 0 0

R 8 14 13 13 14 13 11 11 13 13 10 14 8 14 14

L 0 1 0 0 1 0 0 0 0 0 0 0 0 0 0 2 1 1 7 72

M 1 3 0 1 1 0 1 2 2 1 0 2 0 1 1

R 6 7 5 9 7 7 10 7 11 12 9 14 12 12 11

L 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 1 1 9 73

M 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0

R 3 11 9 12 12 12 13 14 14 14 14 14 14 14 14

L 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 1 1 8 74

M 1 0 0 0 0 0 1 0 0 0 0 0 0 0 0

R 6 13 12 13 14 13 13 14 14 14 14 13 14 14 13

L 1 0 1 0 0 0 0 0 0 0 0 0 0 0 0 2 1 1 7 75

M 3 2 0 1 0 1 0 1 0 0 0 0 0 0 0

R 4 4 6 8 13 11 13 12 13 14 10 6 11 11 9

## MEANS FOR CORRECT RESPONSES FOR ALL EVENTS

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

6.5 8.3 7.3 7.9 9.7 9.7 10.3 10.4 10.3 10.9 10.0 10.9 9.8 11.1 11.1

TABLE E 25 -- CR DATA FOR GROUP 2 UNDER TREATMENT 1 - MALES



## BLOCKS OF 20 TRIALS

EVENT	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	GRP	SEX	TRT	AGE	SUBJ.
L	1	2	1	0	0	0	0	0	0	0	1	7	10	13	13	2	1	2	8	1
M	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0					
R	5	3	5	8	13	11	12	13	14	12	2	2	0	0	0					
L	1	1	0	2	1	2	2	2	2	2	3	6	5	11	11	2	1	2	8	2
M	3	0	0	3	2	2	3	2	4	3	1	1	3	0	0					
R	5	7	8	12	9	6	8	10	10	11	2	2	2	2	1					
L	0	1	2	0	2	0	2	2	2	2	9	10	11	10	8	2	1	2	9	20
M	3	1	1	3	2	2	2	3	3	4	0	3	0	1	1					
R	3	6	12	14	13	11	13	12	12	12	2	2	2	2	2					
L	1	1	2	2	0	2	0	2	2	2	5	9	13	11	9	2	1	2	10	23
M	3	0	0	0	0	0	0	0	0	1	2	3	0	2	0					
R	5	9	11	10	10	13	12	12	12	14	2	1	0	1	1					
L	0	0	0	1	1	1	2	0	2	0	5	7	7	14	11	2	1	2	8	27
M	2	0	0	0	0	0	0	0	0	2	1	0	0	1	2					
R	7	5	8	10	11	11	10	12	13	10	2	0	1	0	1					
L	1	1	2	2	1	1	2	2	1	2	4	12	12	14	13	2	1	2	9	36
M	0	3	0	0	1	3	3	3	3	3	1	1	2	2	2					
R	4	5	7	9	12	13	13	14	14	14	1	1	2	2	2					
L	1	1	1	1	0	1	0	0	0	0	8	9	9	13	7	2	1	2	7	40
M	2	4	1	0	0	0	0	0	0	0	0	0	0	0	0					
R	4	5	5	10	10	10	10	12	13	14	1	1	0	0	0					
L	0	1	1	2	0	1	1	2	1	2	8	7	10	12	8	2	1	2	9	41
M	0	1	3	0	0	0	1	0	0	0	0	0	0	0	0					
R	4	5	7	8	12	11	10	12	13	10	1	0	0	1	1					
L	1	1	0	1	1	0	0	0	0	0	7	10	14	14	14	2	1	2	9	47
M	0	2	2	1	2	0	0	0	0	0	0	0	0	0	0					
R	1	3	11	9	11	8	10	11	13	13	1	0	0	0	0					

TABLE E 26 -- CR DATA FOR GROUP 2 UNDER TREATMENT 2 - MALES (CONTINUED)



BLOCKS OF 20 TRIALS

EVENT 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 GRP SEX TRT AGE SUBJ.

L	0	1	1	0	0	1	2	1	1	9	9	10	9	12	2	1	2	9	56
M	0	0	1	0	0	0	1	0	1	2	1	1	0	0					
R	9	9	11	8	10	10	9	8	11	0	0	0	0	0					
L	0	1	1	1	0	1	2	1	0	8	6	11	7	6	2	1	2	9	57
M	1	1	1	1	0	0	0	0	0	0	0	0	0	0					
R	3	3	7	8	7	8	11	10	10	1	0	0	0	0					
L	0	0	2	2	2	2	1	2	1	7	11	9	11	11	2	1	2	9	58
M	0	0	0	0	1	0	1	0	0	2	3	1	3	3					
R	8	12	12	12	14	13	11	14	12	11	2	2	2	2					
L	1	2	1	0	0	0	0	0	0	3	6	6	6	7	2	1	2	8	80
M	1	2	2	0	0	0	0	0	0	1	0	0	0	0					
R	5	8	11	10	12	11	13	11	13	2	0	1	1	1					
L	1	1	0	1	0	0	0	0	0	6	7	5	8	13	2	1	2	7	85
M	2	1	0	0	0	0	0	0	0	0	1	0	0	0					
R	5	3	9	12	12	14	13	14	14	2	1	1	0	0					
L	2	0	1	2	1	2	2	1	2	7	10	12	10	12	2	1	2	9	87
M	3	0	0	0	0	0	0	0	0	0	0	0	0	0					
R	4	8	11	12	13	11	14	13	14	2	1	0	0	1					

MEANS FOR CORRECT RESPONSES FOR ALL EVENTS

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
6.9	8.1	10.8	11.8	12.4	12.2	12.8	13.9	14.0	14.1	8.1	10.1	10.8	12.2	11.7

TABLE E 26 -- CR DATA FOR GROUP 2 UNDER TREATMENT 2 - MALES



## BLOCKS OF 20 TRIALS

EVENT	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	GRP	SEX	TRT	AGE	SUBJ.
L	2	6	2	3	8	5	4	7	2	4	1	3	3	2	2	2	1	3	11	31
M	4	2	4	2	2	2	4	2	4	3	4	3	4	5	4					
R	4	3	7	6	7	6	8	6	10	9	12	10	12	9	14					
L	2	4	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	3	7	95
M	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0					
R	1	1	11	13	13	13	13	12	13	12	13	14	14	13	14					
L	0	1	4	3	3	3	2	3	3	3	2	2	1	1	2	2	1	3	9	96
M	0	3	4	4	3	4	4	4	4	3	3	2	4	3	3					
R	0	4	6	5	5	3	5	7	3	6	5	6	7	4	5					
L	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	3	7	97
M	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0					
R	2	7	13	12	12	14	11	15	13	14	13	13	13	14	14					
L	0	3	2	4	4	0	3	3	4	5	3	2	2	1	4	2	1	3	7	104
M	0	2	1	0	3	3	2	4	1	2	2	1	1	3	1					
R	3	3	3	3	4	4	6	4	1	4	1	1	4	6	3					
L	5	3	3	2	0	4	3	4	3	2	2	4	3	4	3	2	1	3	7	105
M	3	1	5	4	2	2	3	1	2	1	1	1	4	0	0					
R	5	3	5	3	4	5	4	4	2	4	6	5	5	5	6					
L	1	1	0	2	5	4	3	2	1	1	2	1	2	2	0	2	1	3	9	239
M	0	4	2	1	2	1	1	4	1	3	5	3	3	3	4					
R	2	6	6	7	7	6	3	6	7	5	6	6	7	5	10					
L	2	3	4	3	3	3	3	4	3	4	5	3	2	1	1	2	1	3	9	240
M	1	1	1	2	0	2	4	3	2	3	2	1	4	2	4					
R	6	5	2	3	4	4	3	4	3	3	4	5	4	5	5					
L	3	4	4	3	5	3	3	5	2	3	5	4	3	2	5	2	1	3	10	242
M	3	3	3	2	3	4	2	2	3	3	2	3	0	2	1					
R	4	3	0	3	6	3	5	3	4	4	5	6	7	3	9					

TABLE E 27 -- CR DATA FOR GROUP 2 UNDER TREATMENT 3 - MALES (CONTINUED)



## BLOCKS OF 20 TRIALS

EVENT 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 GRP SEX TRT AGE SUBJ.

L 3 3 1 3 2 4 4 3 4 2 0 3 1 1 1 2 1 3 7 243

M 2 2 2 2 1 2 2 1 2 2 5 3 1 2 3 1 1 3 3

R 5 5 3 4 6 2 2 3 4 5 5 7 3 4 7 4 7 7

L 4 5 2 5 2 4 2 2 1 5 1 1 0 2 3 2 1 3 10 245

M 0 1 1 4 1 2 0 3 3 1 5 5 1 1 0 1 1 3

R 4 5 6 7 2 2 4 6 4 8 7 6 6 9 14 9 14 14

L 5 4 4 3 3 4 4 2 3 6 1 3 1 5 5 2 1 3 10 246

M 3 3 3 5 2 5 4 2 5 2 2 3 1 3 3 3 3 3

R 3 5 5 7 3 4 4 3 5 5 5 9 8 6 7 5 7 7

L 4 1 3 1 2 4 3 3 3 4 3 3 3 1 1 2 1 3 13 261

M 1 5 3 3 4 3 2 2 3 2 3 0 0 2 2 2 2 3

R 2 4 6 6 2 2 3 4 4 2 4 1 4 5 5 4 5 5

L 3 4 2 3 3 5 2 5 3 3 5 4 3 3 2 2 1 3 12 262

M 4 2 1 1 3 4 1 1 0 1 3 1 1 1 2 1 1 3

R 3 3 5 4 6 6 6 4 8 6 8 7 6 7 7 7 7 7

L 3 2 5 5 4 4 4 4 2 0 1 0 1 0 0 2 1 3 263

M 0 1 0 1 1 2 2 0 1 4 1 0 2 2 1 1 1 3

R 3 4 4 3 3 4 5 5 10 10 9 8 7 9 9 9 9 9

## MEANS FOR CORRECT RESPONSES FOR ALL EVENTS

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

7.1 9.2 9.9 10.5 10.3 10.8 10.2 10.8 10.4 11.3 11.5 10.9 10.5 10.5 12.4

TABLE E 27 -- CR DATA FOR GROUP 2 UNDER TREATMENT 3 - MALES



## BLOCKS OF 20 TRIALS

EVENT	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	GRP	SEX	TRT	AGE	SUBJ.
L	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	2	0	1	8	7
M	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0					
R	11	12	14	13	12	12	12	11	10	7	10	11	11	3	11					
L	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	1	10	10
M	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0					
R	10	8	8	8	10	12	10	8	11	11	10	13	11	11	12					
L	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	1	9	11
M	2	2	1	0	0	1	0	0	0	1	0	0	0	0	0					
R	8	8	11	10	12	10	9	9	8	10	11	10	10	10	11					
L	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	1	10	12
M	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0					
R	15	11	11	11	13	15	14	14	13	11	13	14	12	12	14					
L	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	1	8	15
M	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0					
R	11	12	13	11	12	10	13	14	11	15	13	14	12	13	14					
L	1	0	0	0	0	1	0	0	0	0	1	0	0	0	0	2	0	1	8	16
M	1	0	0	0	2	1	0	0	1	1	0	0	0	0	0					
R	0	0	1	2	0	7	9	10	6	6	2	8	8	6	6					
L	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	2	0	1	9	17
M	2	1	1	2	0	0	2	3	0	1	1	1	0	3	0					
R	0	0	0	1	0	6	1	7	6	8	6	9	4	8	9					
L	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	1	9	18
M	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0					
R	6	10	11	12	11	9	14	12	12	10	11	12	12	13	8					
L	0	2	0	0	1	0	2	1	0	0	0	0	0	1	0	2	0	1	9	50
M	1	1	0	1	2	1	1	1	2	0	1	1	0	1	1					
R	2	3	6	2	3	4	7	5	4	6	6	8	7	10	11					

TABLE E 28 -- CR DATA FOR GROUP 2 UNDER TREATMENT 1 - FEMALES (CONTINUED)



## BLOCKS OF 20 TRIALS

EVENT 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 GRP SEX TRT AGE SUBJ.

L 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 0 1 8 52

M 0

R 13 13 11 14 14 14 13 12 14 11 12 12 11 11 12

L 0 0 1 0 0 0 0 0 1 0 0 0 0 0 0 2 0 1 10 69

M 0 2 2 2 1 0 0 1 0 0 1 0 1 1 2

R 7 8 11 8 7 7 8 7 6 8 7 6 10 9 10

L 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 0 1 9 76

M 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0

R 11 13 13 14 14 14 13 14 13 13 13 14 13 14 13

L 0 1 0 0 1 1 0 0 0 0 0 0 0 0 0 2 0 1 7 78

M 0 2 3 0 0 1 0 0 0 1 0 1 0 0 0

R 3 7 9 7 10 10 7 6 10 9 10 11 8 4 7

L 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 0 1 9 91

M 0 0 1 0 1 0 1 1 2 1 1 0 0 0 0

R 9 9 10 11 8 10 11 9 10 9 13 14 13 13 12

L 0 0 1 0 0 0 0 0 0 0 1 0 0 0 0 2 0 1 10 92

M 0 1 0 0 1 0 1 1 1 0 1 1 0 0 0

R 11 11 11 9 11 11 12 10 11 11 11 12 10 12 12

## MEANS FOR CORRECT RESPONSES FOR ALL EVENTS

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

8.3 9.2 10.0 9.2 9.8 10.5 10.7 10.4 10.1 10.0 10.3 11.5 10.3 10.5 11.1

TABLE E 28 -- CR DATA FOR GROUP 2 UNDER TREATMENT 1 - FEMALES



## BLOCKS OF 20 TRIALS

EVENT	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	GRP	SEX	TRT	AGE	SUBJ.
L	5	7	9	13	12	13	14	12	12	14	0	0	0	1	0	2	0	2	6	3
M	3	3	0	0	0	0	1	1	0	0	0	0	0	1	0					
R	0	1	0	0	0	0	0	0	0	0	5	10	3	3	7					
L	5	12	11	12	12	13	14	13	14	12	1	0	0	0	0	2	0	2	8	19
M	2	0	0	0	0	0	0	0	0	0	0	14	0	0	0					
R	0	1	0	0	0	0	0	0	0	0	8	0	13	14	13					
L	4	7	4	6	2	6	6	9	11	13	1	2	0	1	0	2	0	2	7	25
M	1	2	3	1	0	1	1	0	0	0	0	0	0	0	0					
R	1	0	0	0	1	0	0	0	0	0	7	5	3	3	5					
L	4	13	10	11	11	10	13	12	13	13	1	0	0	0	0	2	0	2	9	26
M	0	0	1	0	0	0	1	1	0	0	0	0	0	0	0					
R	0	0	1	0	0	0	0	0	0	0	4	8	12	9	9					
L	6	4	7	11	13	12	14	14	14	14	1	0	0	0	0	2	0	2	7	34
M	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0					
R	0	0	0	0	0	0	0	0	0	0	2	12	9	9	9					
L	12	12	12	14	14	14	14	14	14	14	2	2	2	2	2	2	0	2	9	38
M	0	0	0	0	2	2	2	2	2	2	1	2	2	2	2					
R	1	1	0	0	2	2	2	2	2	2	11	14	13	14	13					
L	5	13	13	14	14	14	3	3	7	11	2	0	1	0	0	2	0	2	7	39
M	2	0	0	0	0	0	0	0	0	1	1	0	1	2	0					
R	0	0	0	0	0	0	1	0	0	0	0	4	4	5	9					
L	3	3	5	7	8	10	11	13	13	9	1	0	0	2	2	2	0	2	8	42
M	1	1	1	3	0	1	0	1	0	0	1	0	0	0	0					
R	1	0	0	1	0	0	2	1	0	0	7	8	10	12	8					
L	4	7	5	6	10	9	9	10	9	12	1	0	0	0	0	2	0	2	7	45
M	2	2	0	0	0	0	0	0	0	0	1	0	0	0	0					
R	1	2	0	0	0	0	0	0	0	0	4	10	13	14	14					

TABLE E 29 -- CR DATA FOR GROUP 2 UNDER TREATMENT 2 - FEMALES (CONTINUED)



## BLOCKS OF 20 TRIALS

EVENT	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	GRP	SEX	TRT	AGE	SUBJ.
L	7	11	12	11	12	10	12	14	14	14	2	1	2	2	0	2	0	2	11	46
M	3	0	0	0	0	0	2	2	2	2	0	0	0	0	1					
R	1	2	2	2	2	2	2	2	2	2	9	14	12	11	13					
L	4	4	5	5	6	3	8	7	9	12	1	0	0	0	0	2	0	2	7	48
M	2	0	3	1	1	1	0	0	0	0	0	0	0	0	0					
R	0	2	1	1	1	0	1	0	0	0	8	9	12	11	13					
L	6	1	5	4	5	6	5	3	4	5	1	1	1	0	1	2	0	2	12	79
M	3	1	1	3	2	2	1	1	2	2	2	8	11	0	1					
R	1	0	0	1	0	1	1	2	1	0	3	0	0	13	12					
L	10	9	10	12	11	14	3	1	0	0	0	0	1	3	0	2	0	2	10	83
M	0	0	0	0	0	2	1	0	0	0	0	0	1	1	0					
R	0	0	0	0	0	0	6	11	12	10	14	10	11	6	8					
L	8	6	8	7	11	0	6	0	1	1	3	0	1	0	0	2	0	2	9	84
M	0	0	0	0	0	2	1	1	0	1	0	0	0	0	0					
R	0	0	0	0	0	12	0	7	7	6	7	11	8	11	11					
L	3	11	10	12	13	14	14	12	13	12	2	1	0	0	0	2	0	2	10	88
M	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0					
R	1	0	0	0	0	0	0	0	1	2	3	8	8	12	10					

## MEANS FOR CORRECT RESPONSES FOR ALL EVENTS

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
7.5	9.3	9.3	10.5	11.0	11.7	11.4	11.5	11.9	12.4	8.0	10.3	10.3	10.9	10.9

TABLE E 29 -- CR DATA FOR GROUP 2 UNDER TREATMENT 2 - FEMALES



## BLOCKS OF 20 TRIALS

EVENT	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	GRP	SEX	TRT	AGE	SUBJ.
L	3	5	6	1	5	3	4	0	3	0	2	1	1	5	5	2	0	3	10	28
M	1	0	0	0	0	0	0	0	0	0	3	1	2	2	4					
R	4	9	6	5	5	7	6	7	4	4	5	4	4	3	2					
L	4	3	4	4	5	4	2	7	5	4	5	2	5	3	8	2	0	3	7	30
M	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0					
R	7	4	9	9	8	9	10	5	6	7	6	7	6	9	4					
L	5	3	1	1	4	3	5	4	3	1	2	2	2	1	2	2	0	3	10	32
M	2	1	2	4	4	2	4	4	4	4	5	2	3	6	4					
R	5	7	6	6	6	5	6	10	10	10	11	10	11	9	14					
L	1	3	1	0	2	2	0	1	2	0	0	0	0	0	0	2	0	3	7	33
M	1	2	3	2	2	0	0	0	0	0	0	0	0	0	0					
R	4	1	4	6	8	6	13	13	10	13	11	14	12	12	12					
L	3	5	4	10	8	11	7	3	3	4	3	3	1	0	2	2	0	2	7	82
M	3	1	2	0	2	2	2	6	4	4	6	3	6	4	5					
R	0	1	2	0	1	2	2	2	4	4	5	6	6	12	6					
L	10	9	10	12	11	14	3	1	0	0	0	0	1	3	0	2	0	3	10	83
M	0	0	0	0	0	2	1	0	0	0	0	0	1	1	0					
R	0	0	0	0	0	0	6	11	12	10	14	10	11	6	8					
L	8	6	8	7	11	0	6	0	1	1	3	0	1	0	0	2	0	3	9	84
M	0	0	0	0	0	2	1	1	0	1	0	0	0	0	0					
R	0	0	0	0	0	12	0	7	7	6	7	11	8	11	11					
L	3	3	2	3	2	4	2	4	4	3	0	1	1	1	2	2	0	3	11	98
M	1	2	5	3	0	1	2	3	3	0	1	0	2	0	2					
R	3	4	6	3	3	7	4	7	7	3	5	5	4	5	4					
L	0	3	2	0	3	3	0	0	1	0	2	1	2	1	2	2	0	3	7	100
M	0	4	3	3	2	2	3	3	1	3	3	2	1	3	0					
R	2	4	3	2	3	4	2	4	1	3	3	4	1	1	2					

TABLE E 30 -- CR DATA FOR GROUP 2 UNDER TREATMENT 3 - FEMALES (CONTINUED)



## BLOCKS OF 20 TRIALS

EVENT	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	GRP	SEX	TRT	AGE	SUBJ.
L	1	2	4	2	1	3	4	5	2	2	2	3	4	4	3	2	0	3	9	237
M	2	2	2	0	2	3	2	2	2	3	0	2	3	3	3					
R	2	5	4	3	7	4	4	3	3	5	3	5	6	3	5					
L	4	5	3	3	4	3	4	2	3	3	3	3	3	2	3	2	0	3	8	238
M	2	3	6	4	4	3	2	4	4	4	3	3	5	3	2					
R	1	2	3	2	2	4	2	2	3	2	2	1	0	2	3					
L	2	1	3	4	4	3	4	4	5	5	2	3	4	5	6	2	0	3	10	241
M	4	4	0	3	3	4	3	6	2	3	4	4	5	1	3					
R	0	4	2	2	5	2	4	2	4	4	1	3	6	2	5					
L	4	3	0	3	3	3	4	5	4	5	4	2	1	3	2	2	0	3	6	244
M	8	2	3	4	1	1	3	1	3	3	2	2	2	2	2					
R	4	5	5	5	8	4	6	3	4	5	4	3	4	4	2					
L	3	5	2	6	0	4	0	1	1	2	3	4	2	3	5	2	0	3	9	247
M	2	2	2	4	0	3	1	2	1	1	2	1	2	4	3					
R	2	1	3	3	2	6	7	6	9	6	6	7	5	6	4					
L	1	5	4	2	3	3	3	2	0	1	1	1	1	2	2	2	0	3	10	248
M	1	1	0	0	2	1	0	0	2	1	1	1	1	1	0					
R	4	5	9	5	8	8	6	8	10	8	9	10	7	10	9					

## MEANS FOR CORRECT RESPONSES FOR ALL EVENTS

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
7.8	9.1	9.6	9.1	10.3	11.3	10.0	10.7	10.5	9.9	10.3	9.8	10.2	10.5	10.8

TABLE E 30 -- CR DATA FOR GROUP 2 UNDER TREATMENT 3 - FEMALES



## BLOCKS OF 20 TRIALS

EVENT	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	GRP	SEX	TRI	AGE	SUBJ.
L	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1	1	23	110
M	2	0	0	0	0	0	0	0	0	0	0	0	0	0	1					
R	2	13	13	14	12	11	13	14	13	13	13	14	13	13	12					
L	1	0	0	1	0	1	0	0	0	0	0	0	0	0	2	3	1	1	21	111
M	2	1	1	0	0	0	0	0	0	0	0	0	0	1	1					
R	1	7	9	11	11	12	12	12	12	14	10	13	13	12	11					
L	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1	1	26	112
M	0	0	2	2	1	0	0	0	0	0	0	0	0	0	0					
R	5	9	13	10	9	14	14	12	13	13	13	13	14	14	14					
L	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	3	1	1	22	113
M	1	0	1	0	1	0	0	0	1	0	1	0	0	0	0					
R	8	10	12	9	10	14	11	13	11	11	14	11	14	14	12					
L	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1	2	29	114
M	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0					
R	7	11	13	11	14	13	12	14	15	14	13	15	14	14	14					
L	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	3	1	1	26	116
M	0	0	1	1	1	0	0	1	1	0	3	0	2	0	1					
R	7	10	14	12	11	12	12	11	14	13	10	13	12	13	11					
L	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	3	1	1	26	117
M	2	2	1	0	0	0	0	0	0	1	0	2	1	0	0					
R	6	8	13	12	13	12	13	12	13	14	12	12	13	12	13					
L	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1	1	23	118
M	2	0	0	0	0	1	0	0	0	0	0	0	0	0	0					
R	4	12	12	14	12	12	10	15	13	14	13	14	14	14	14					
L	0	0	1	0	1	1	0	0	0	0	0	0	0	0	0	3	1	1	25	119
M	2	1	1	2	3	1	2	0	1	0	1	0	1	1	0					
R	4	5	9	12	10	11	13	13	14	13	14	13	12	12	13					

TABLE E 31 -- CR DATA FOR GROUP 3 UNDER TREATMENT 1 - MALES (CONTINUED)



## BLOCKS OF 20 TRIALS

EVENT 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 GRP SEX TRT AGE SUBJ.

L 1 0 0 0 1 0 0 0 0 1 0 0 0 0 0 3 1 1 23 120  
M 2 1 1 0 0 0 0 0 1 0 0 0 0 1 0

R 3 11 12 10 12 12 12 12 13 13 13 13 13 10 12

L 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 3 1 1 24 121

M 2 0 0 1 1 0 1 0 2 1 0 0 0 0 0

R 4 13 12 13 13 14 13 13 14 13 14 13 13 14 13

L 2 0 0 0 0 0 0 1 0 0 0 0 0 0 0 3 1 1 24 122

M 2 1 0 0 0 0 0 0 1 0 1 0 0 0 0

R 7 11 11 9 13 14 13 13 13 13 12 13 14 14 13

L 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 3 1 1 24 123

M 2 3 3 1 2 0 0 2 0 0 0 0 1 0 0

R 4 6 11 10 8 12 14 10 13 14 13 14 14 13 14

L 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 3 1 1 25 124

M 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0

R 3 14 14 14 14 14 14 13 14 14 14 14 14 14 14

L 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 3 1 1 24 125

M 0 0 1 0 1 0 0 0 0 0 2 3 1 1 3

R 2 8 11 14 11 12 12 11 11 12 9 12 9 11 11

## MEANS FOR CORRECT RESPONSES FOR ALL EVENTS

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

7.1 10.5 13.0 12.3 12.3 12.9 12.7 12.9 13.5 13.5 13.0 13.5 13.2 14.9

TABLE E 31 --- CR DATA FOR GROUP 3 UNDER TREATMENT 1 - MALES



## BLOCKS OF 20 TRIALS

EVENT	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	GRP	SEX	TRT	AGE	SUBJ.
L	0	1	2	1	2	2	2	2	1	9	13	14	14	13	14	3	1	2	23	137
M	1	2	3	2	4	4	4	4	2	2	3	4	4	4	4					
R	13	10	11	12	12	13	14	13	13	2	1	2	2	2	2					
L	1	0	1	0	2	2	2	2	2	2	11	14	14	14	14	3	1	2	26	138
M	1	1	1	3	4	4	4	3	3	4	3	4	3	4	4					
R	10	13	13	13	13	13	13	14	14	14	1	2	2	1	1					
L	1	0	1	1	2	2	1	2	2	2	8	13	14	14	13	3	1	2	27	139
M	2	0	2	2	2	3	3	4	4	4	1	4	4	4	3					
R	6	13	11	13	12	13	15	14	14	14	1	2	2	2	1					
L	0	0	0	0	0	0	0	1	1	1	9	13	13	14	13	3	1	2	27	140
M	0	0	0	0	0	0	0	1	0	1	1	1	1	1	1					
R	14	14	13	14	14	13	13	14	13	14	1	1	1	1	1					
L	0	0	0	0	2	0	0	0	1	0	8	14	11	11	14	3	1	2	23	143
M	1	1	1	1	1	2	1	1	0	1	2	1	2	1	3					
R	9	12	11	14	12	13	13	12	13	12	1	0	0	1	1					
L	0	1	0	0	0	0	2	0	0	0	9	12	13	13	12	3	1	2	40	144
M	1	0	0	0	1	1	2	2	2	1	2	0	1	0	0					
R	4	13	13	14	14	12	13	14	13	14	1	0	1	0	0					
L	1	1	1	1	1	2	2	2	2	2	3	12	14	14	14	3	1	2	33	145
M	2	0	0	0	3	3	3	4	4	4	1	4	4	4	4					
R	0	10	13	12	13	12	13	13	13	14	9	2	2	2	2					
L	0	0	1	1	1	1	1	1	1	1	10	13	12	13	12	3	1	2	35	146
M	0	1	2	2	1	1	1	1	2	2	2	0	2	1	2					
R	6	12	12	14	14	13	14	13	13	12	1	1	1	0	1					
L	0	0	0	0	1	1	0	1	1	1	10	14	14	14	13	3	1	2	27	147
M	0	0	1	1	1	1	1	1	1	1	3	1	1	1	1					
R	10	13	14	14	13	12	14	14	13	14	1	1	0	1	1					

TABLE E 32 -- CR DATA FOR GROUP 3 UNDER TREATMENT 2 - MALES (CONTINUED)

060002 DE SC 181972

NEW!

Year	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065	2066	2067	2068	2069	2070	2071	2072	2073	2074	2075	2076	2077	2078	2079	2080	2081	2082	2083	2084	2085	2086	2087	2088	2089	2090	2091	2092	2093	2094	2095	2096	2097	2098	2099
1970	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065	2066	2067	2068	2069	2070	2071	2072	2073	2074	2075	2076	2077	2078	2079	2080	2081	2082	2083	2084	2085	2086	2087	2088	2089	2090	2091	2092	2093	2094	2095	2096	2097	2098	2099

[illegible]

## BLOCKS OF 20 TRIALS

EVENT 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 GRP SEX TRT AGE SUBJ.

L 1 0 1 1 1 1 1 1 1 1 4 11 13 12 12 3 1 2 33 149

M 2 1 0 0 1 2 1 2 1 2 2 2 2 3 2 2

R 4 8 13 11 12 12 12 11 11 12 1 1 2 1 1

L 1 1 2 0 1 2 1 2 2 2 11 13 11 11 11 3 1 2 24 150

M 2 1 1 0 0 1 2 2 3 4 2 4 3 3 3

R 6 8 8 12 12 12 14 12 12 13 2 2 2 2 2

L 0 0 2 2 2 2 2 0 2 2 11 14 14 14 14 3 1 2 26 166

M 1 0 0 2 2 4 4 4 4 4 3 4 4 4 4

R 4 10 12 14 14 14 14 14 14 14 1 2 2 2 2

L 1 2 0 2 2 2 2 2 2 2 14 14 14 14 14 3 1 2 29 167

M 1 1 2 4 4 4 4 4 4 4 2 4 3 4 4

R 5 11 12 12 14 14 14 14 14 14 2 2 2 2 2

L 1 2 2 2 2 2 2 2 2 2 12 13 14 14 14 3 1 2 26 172

M 1 0 1 2 3 4 4 4 4 4 2 4 4 4 4

R 3 5 9 11 12 14 14 14 14 14 1 2 2 2 2

L 0 0 1 2 2 2 2 2 2 2 11 14 14 14 14 3 1 2 42 173

M 3 1 3 3 2 2 4 4 4 4 2 4 4 4 4

R 8 10 13 13 13 12 12 11 14 13 2 2 2 2 2

## MEANS FOR CORRECT RESPONSES FOR ALL EVENTS

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

8.5 11.9 13.9 15.2 16.3 16.6 17.3 17.2 17.2 17.4 13.6 17.4 17.6 17.5 17.5

TABLE E\_32 -- CR DATA FOR GROUP 3 UNDER TREATMENT 2 - MALES



## BLOCKS OF 20 TRIALS

EVENT	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	GRP	SEX	TRT	AGE	SUBJ.
L	4	7	3	3	8	4	6	4	4	3	2	3	4	4	4	3	1	3	29	126
M	0	0	0	0	0	1	0	1	1	1	2	2	2	2	3					
R	7	8	9	10	5	7	6	7	7	11	9	7	7	7	8					
L	2	2	2	2	2	1	1	0	1	1	2	0	1	0	0	3	1	3	28	127
M	2	5	0	1	1	0	2	3	0	2	0	1	0	0	1					
R	3	4	6	6	6	10	7	9	10	11	9	13	11	11	14					
L	3	4	2	4	1	0	0	1	2	0	2	1	1	1	1	3	1	3	23	130
M	2	2	2	2	2	1	2	1	1	2	2	3	4	2	5					
R	3	2	4	8	7	9	11	12	13	14	10	13	12	10	9					
L	5	6	1	0	3	0	2	0	0	1	2	0	4	2	2	3	1	3	20	131
M	2	1	3	4	1	3	3	4	3	4	3	4	2	2	3					
R	6	7	6	8	6	10	8	9	11	8	9	10	10	10	9					
L	1	5	2	3	2	1	0	2	0	0	1	0	0	1	1	3	1	3	25	132
M	2	1	1	3	1	1	1	1	2	1	2	3	1	3	1					
R	2	7	6	6	5	12	8	10	9	9	10	6	6	9	9					
L	1	0	0	0	0	0	0	0	0	0	1	1	1	0	0	3	1	3	26	133
M	1	0	0	0	0	1	3	4	6	4	4	6	5	4	4					
R	11	11	10	13	10	13	14	12	13	13	14	11	11	12	12					
L	1	3	1	5	1	2	3	2	3	3	1	2	2	2	4	3	1	3	27	218
M	2	0	1	2	3	3	2	1	2	2	2	2	3	2	1					
R	2	4	0	0	0	0	0	7	10	9	10	11	11	10	10					
L	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	3	1	3	30	310
M	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0					
R	8	9	9	12	14	13	13	14	13	14	13	12	13	13	15					
L	4	4	3	4	7	3	2	1	0	0	0	0	0	0	0	3	1	3	28	311
M	3	2	1	1	2	2	1	1	0	0	0	0	0	0	0					
R	2	3	6	3	0	8	7	10	12	14	13	13	14	13	15					

TABLE E 33 -- CR DATA FOR GROUP 3 UNDER TREATMENT 3 - MALES (CONTINUED)



## BLOCKS OF 20 TRIALS

EVENT 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 GRP SEX TRI AGE SUBJ.

L 3 1 2 3 4 2 3 2 4 2 1 5 2 3 3 3 1 3 40 313

M 2 2 1 3 1 2 2 1 0 3 2 0 3 2 1 3 1 3 40 313

R 7 8 4 3 4 9 8 9 10 8 8 9 9 9 9 9 9 9 40 313

L 3 2 1 4 2 4 1 1 2 2 5 4 1 4 4 3 1 3 31 314

M 3 3 1 3 0 1 1 1 1 1 2 0 1 1 2 3 1 3 31 314

R 4 6 7 6 9 4 8 9 9 7 4 4 10 6 7 7 7 7 31 314

L 1 3 2 3 3 1 0 1 1 1 1 1 0 0 0 3 1 3 27 315

M 0 0 0 0 1 0 0 0 0 0 0 1 0 0 0 3 1 3 27 315

R 9 8 10 8 10 9 12 12 12 13 11 10 12 12 13 3 1 3 27 315

L 4 7 3 2 4 3 2 0 6 3 1 2 5 3 3 3 1 3 34 316

M 2 1 2 2 2 3 3 2 1 1 1 0 1 2 0 3 1 3 34 316

R 1 2 4 7 6 8 8 8 9 7 9 9 7 9 7 7 7 7 34 316

L 1 3 1 2 0 2 2 4 1 2 2 1 2 1 0 3 1 3 41 317

M 0 3 4 2 2 1 3 4 5 3 2 3 6 2 3 3 1 3 41 317

R 3 4 6 7 7 7 7 5 7 8 7 6 7 9 9 7 7 7 41 317

L 3 4 1 0 0 0 0 0 0 0 0 0 0 0 0 3 1 3 31 318

M 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 3 1 3 31 318

R 2 5 12 14 13 14 13 14 14 14 14 14 14 14 14 3 1 3 31 318

## MEANS FOR CORRECT RESPONSES FOR ALL EVENTS

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

8.9 10.6 9.3 11.3 10.3 11.7 11.7 12.6 13.7 13.5 12.9 12.9 13.7 13.1 13.8

TABLE E 33 -- CR DATA FOR GROUP 3 UNDER TREATMENT 3 - MALES



## BLOCKS OF 20 TRIALS

EVENT	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	GRP	SEX	TRT	AGE	SUBJ.
L	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	1	13	70
M	0	0	1	0	1	0	1	0	0	0	1	0	0	0	0					
R	13	12	13	11	12	9	13	12	12	12	11	11	14	14	14					
L	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	3	0	1	17	135
M	2	1	0	0	1	0	0	1	0	0	0	0	0	0	0					
R	3	4	9	9	11	10	11	15	10	11	10	11	14	12	9					
L	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	1	49	153
M	0	0	0	0	0	0	0	1	0	0	2	0	0	0	0					
R	9	8	12	14	12	10	11	11	12	14	10	11	5	6	13					
L	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	3	0	1	21	156
M	1	0	1	0	2	0	0	0	0	0	1	0	0	0	0					
R	7	9	9	10	10	11	11	12	12	12	12	13	11	11	12					
L	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	1	56	157
M	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0					
R	3	13	13	14	14	14	14	14	14	14	14	14	14	14	14					
L	0	0	0	0	0	0	0	0	0	1	0	0	1	1	0	3	0	1	24	158
M	0	1	0	0	0	1	0	0	0	0	1	0	2	0	0					
R	9	10	12	9	13	14	12	11	12	10	11	14	11	10	11					
L	3	0	0	0	0	0	0	0	0	0	0	0	0	1	0	3	0	1	21	159
M	2	0	0	0	0	0	2	0	0	1	0	1	1	0	0					
R	6	7	10	13	11	10	10	10	11	12	11	12	13	13	12					
L	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	1	18	161
M	1	0	1	1	1	0	0	2	1	0	1	1	1	0	0					
R	9	11	12	11	12	12	13	13	12	12	12	11	11	7	9					
L	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	1	19	162
M	3	1	0	0	1	0	0	1	1	0	0	0	0	0	0					
R	2	5	9	10	11	12	13	13	12	13	13	12	14	13	13					

TABLE E 34 -- CR DATA FOR GROUP 3 UNDER TREATMENT 1 - FEMALES (CONTINUED)



## BLOCKS OF 20 TRIALS

EVENT 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 GRP SEX TRT AGE SUBJ.

L 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 3 0 1 20 163

M 1 1 2 1 0 0 1 2 1 3 3 2 0 1 0 0

R 6 12 11 14 11 13 11 10 11 8 9 10 10 13 9

L 1 0 0 0 1 0 1 0 0 0 0 2 0 1 0 3 0 1 21 164

M 0 2 1 1 0 1 0 0 0 1 0 0 0 2 0

R 7 12 9 11 13 10 10 11 11 12 11 12 12 10 10

L 0 0 0 1 1 0 0 1 0 0 1 1 0 0 0 3 0 1 21 165

M 1 3 0 1 2 0 0 0 1 1 0 2 1 1 0

R 2 7 10 11 13 12 10 10 11 9 9 11 11 8 9

L 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 3 0 1 20 222

M 1 1 0 2 1 0 1 0 0 0 0 0 0 0 1

R 3 7 8 9 7 11 10 10 7 13 12 13 11 12 12

L 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 3 0 1 17 223

M 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0

R 8 12 14 13 12 13 14 12 14 14 14 14 14 14 14

L 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 3 0 1 18 224

M 0 3 1 0 2 0 1 0 1 2 1 0 1 1 0

R 2 7 7 11 8 10 1 10 10 8 10 10 7 8 12

## MEANS FOR CORRECT RESPONSES FOR ALL EVENTS

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

7.3 10.1 11.0 11.8 12.3 11.5 11.5 12.1 11.9 12.2 12.0 12.5 11.9 11.5 11.6

TABLE E 34 -- CR DATA FOR GROUP 3 UNDER TREATMENT 1 - FEMALES



## BLOCKS OF 20 TRIALS

EVENT	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	GRP	SEX	TRT	AGE	SUBJ.
L	5	10	10	12	10	13	12	14	14	14	2	1	2	2	1	3	0	2	21	141
M	2	1	2	1	4	3	3	4	4	3	3	2	3	2	3					
R	1	0	1	1	1	1	1	2	1	2	8	13	13	11	13					
L	7	10	11	12	14	12	13	11	14	13	1	1	1	0	1	3	0	2	24	142
M	2	1	1	0	1	0	0	1	2	1	1	1	2	2	2					
R	0	0	0	0	0	0	1	1	1	1	7	12	12	11	10					
L	4	9	11	14	14	13	14	14	14	1	2	2	2	2	2	3	0	2	21	152
M	2	1	0	4	3	4	4	4	4	1	4	3	4	4	4					
R	1	0	1	1	2	2	2	2	2	8	10	14	14	14	14					
L	21	12	12	12	11	13	13	13	13	14	1	1	2	2	2	3	0	2	14	155
M	1	1	2	2	2	3	3	2	3	2	4	4	4	3	4					
R	0	0	1	1	1	1	2	2	2	1	9	12	12	14	14					
L	7	11	12	11	12	13	14	14	13	14	2	1	2	2	2	3	0	2	19	168
M	1	0	2	1	0	3	4	3	3	3	1	3	3	3	3					
R	1	0	2	2	1	2	2	2	2	2	10	11	14	13	14					
L	5	10	11	12	13	11	14	14	14	14	2	2	2	2	2	3	0	2	18	169
M	1	1	3	2	4	4	4	4	4	4	3	4	4	4	4					
R	2	0	2	2	2	2	2	2	2	2	13	14	14	14	14					
L	6	9	11	12	11	11	10	12	12	11	1	2	2	2	2	3	0	2	51	170
M	1	0	0	0	1	0	0	0	0	0	1	0	0	0	3					
R	0	1	1	1	1	2	1	0	0	1	6	12	12	12	14					
L	6	14	12	12	12	12	13	14	14	14	2	2	2	2	2	3	0	2	24	171
M	0	0	0	0	0	0	1	3	3	4	1	4	4	4	0					
R	0	1	2	2	2	2	1	2	2	2	11	14	14	13	11					
L	11	13	12	11	14	14	12	14	14	13	1	2	2	2	2	3	0	2	22	174
M	0	1	2	4	3	4	2	3	4	4	2	4	4	4	4					
R	0	2	2	2	2	2	1	2	2	2	11	14	14	14	14					

TABLE E 35 -- CR DATA FOR GROUP 3 UNDER TREATMENT 2 - FEMALES (CONTINUED)



## BLOCKS OF 20 TRIALS

EVENT 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 GRP SEX TRT AGE SUBJ.

L 7 12 14 13 14 14 14 14 14 2 2 2 2 2 2 3 0 2 21 175

M 0 0 1 2 2 3 4 4 4 1 3 3 4 3 4 4 4 4 21 175

R 1 1 1 1 1 1 2 2 2 12 14 14 14 14 14 14 14 14 21 175

L 7 10 10 12 13 14 14 14 13 2 2 2 2 2 2 3 0 2 20 176

M 0 1 2 1 1 2 2 1 2 2 3 4 4 4 4 4 4 4 20 176

R 0 0 1 2 2 2 2 2 2 11 14 14 14 14 14 14 14 14 20 176

L 3 10 12 13 12 14 14 14 14 14 2 2 2 2 2 2 3 0 2 22 225

M 1 0 0 1 3 4 4 4 4 4 0 4 4 4 4 4 4 4 22 225

R 1 2 2 1 2 2 2 2 2 2 10 14 14 14 14 14 14 14 22 225

L 1 8 9 11 10 9 11 10 11 11 1 0 0 0 0 0 3 0 2 20 226

M 2 0 1 0 1 0 0 1 0 1 0 0 0 0 0 0 0 0 20 226

R 2 0 0 2 1 0 0 0 0 0 5 14 13 14 14 13 13 13 20 226

L 8 10 11 12 13 13 14 14 14 14 2 2 2 2 2 2 3 0 2 21 227

M 2 0 0 2 0 2 3 4 2 4 4 4 4 4 4 4 4 4 21 227

R 1 2 1 1 2 2 2 2 2 2 10 14 14 14 14 14 14 14 21 227

L 2 1 0 2 2 2 2 2 2 7 14 14 14 14 14 14 3 0 2 20 229

M 3 4 2 3 4 4 4 4 4 4 4 4 4 4 4 4 4 4 20 229

R 6 10 13 13 12 14 14 14 14 8 2 2 2 2 2 2 2 2 20 229

## MEANS FOR CORRECT RESPONSES FOR ALL EVENTS

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

9.4 12.8 14.8 16.1 16.9 17.8 18.3 19.0 19.1 18.0 14.4 18.2 18.9 18.3 18.7

TABLE E 35 --- CR DATA FOR GROUP 3 UNDER TREATMENT 2 - FEMALES



## BLOCKS OF 20 TRIALS

EVENT	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	GRP	SEX	TRT	AGE	SUBJ.
L	2	4	4	0	0	0	1	0	0	2	0	2	0	1	1	3	0	3	45	128
M	2	3	2	3	4	2	2	2	1	2	4	2	3	2	2					
R	5	4	9	4	6	6	4	6	7	10	7	7	10	10	9					
L	1	1	1	2	3	2	1	1	2	3	3	3	3	2	1	3	0	3	54	129
M	3	5	3	6	2	4	5	3	1	1	2	1	2	3	1					
R	5	4	3	6	4	4	5	2	8	7	5	3	4	7	4					
L	2	4	2	4	5	4	3	5	4	1	1	1	2	0	1	3	0	3	45	134
M	1	2	4	3	0	2	0	1	1	2	0	2	3	3	0					
R	4	2	5	1	8	5	3	4	6	8	8	11	9	9	11					
L	2	4	3	3	3	2	4	1	3	2	3	4	1	4	3	3	0	3	20	208
M	4	2	4	2	3	1	1	4	1	2	2	2	2	2	2					
R	3	4	3	6	6	10	6	9	11	11	12	10	10	11	11					
L	5	1	4	3	4	5	2	3	3	2	3	4	4	1	4	3	0	3	19	209
M	3	1	3	4	3	2	2	2	0	0	1	3	2	2	1					
R	7	5	6	4	2	2	5	2	4	5	6	5	4	5	7					
L	4	2	3	3	2	2	4	0	4	1	2	6	3	6	1	3	0	3	19	210
M	3	4	2	1	1	2	4	4	3	2	1	2	0	2	0					
R	4	3	5	6	8	7	4	8	7	5	11	6	8	6	10					
L	0	3	4	2	0	0	3	2	0	5	7	3	0	1	2	3	0	3	19	211
M	5	5	4	3	2	3	4	3	4	3	2	2	3	2	2					
R	7	5	4	4	11	9	6	6	8	4	5	9	8	8	7					
L	1	3	3	2	3	4	3	4	2	3	4	5	5	3	2	3	0	3	18	212
M	1	3	3	2	4	3	4	3	5	4	4	3	2	3	1					
R	3	5	4	4	4	8	5	6	6	6	6	5	7	5	9					
L	5	3	1	3	2	1	1	0	1	1	1	2	1	1	0	3	0	3	20	213
M	3	5	3	2	1	1	2	2	1	2	2	2	1	2	2					
R	3	4	6	8	6	5	3	9	7	5	6	5	5	6	8					

TABLE E 36 -- CR DATA FOR GROUP 3 UNDER TREATMENT 3 - FEMALES (CONTINUED)



## BLOCKS OF 20 TRIALS

EVENT 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 GRP SEX TRT AGE SUBJ.

L 3 7 4 3 7 5 6 5 7 7 6 5 5 2 3 3 0 3 18 215

M 4 2 4 3 1 3 2 3 1 2 2 2 2 2 2 2 2 2 18 215

R 5 5 4 4 4 6 6 7 6 5 6 7 7 7 10 7 7 10 18 215

L 3 4 3 4 2 1 1 2 3 2 4 2 3 1 4 3 0 3 17 216

M 4 0 2 3 3 1 1 3 1 3 4 4 4 1 2 4 4 2 17 216

R 4 4 4 6 3 11 8 5 7 5 6 10 7 9 6 6 6 6 17 216

L 2 4 3 2 2 1 4 0 2 4 1 0 2 2 2 3 0 3 15 217

M 0 1 2 2 3 2 3 1 3 1 2 1 1 0 1 1 1 1 15 217

R 2 4 4 6 7 10 7 11 7 8 6 12 7 10 10 7 7 10 15 217

L 3 5 5 5 4 3 3 3 3 3 5 4 5 1 2 3 0 3 47 219

M 0 3 4 3 3 2 2 3 4 0 3 4 3 6 3 4 4 3 47 219

R 4 2 4 6 5 7 8 8 8 4 7 9 5 8 8 8 8 8 47 219

L 2 1 2 2 1 3 1 3 2 2 4 2 3 3 3 3 0 3 19 220

M 1 2 2 2 1 1 3 1 3 2 1 4 2 2 3 4 4 3 19 220

R 11 8 11 10 12 11 12 11 11 11 11 13 13 11 11 11 11 11 19 220

L 0 1 2 3 0 3 1 2 3 3 6 3 4 0 1 3 0 3 18 221

M 2 2 1 2 2 2 2 2 2 3 0 2 2 5 2 2 2 2 18 221

R 8 8 7 8 7 9 9 10 11 8 9 8 11 11 12 8 8 12 18 221

## MEANS FOR CORRECT RESPONSES FOR ALL EVENTS

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

9.7 10.3 11.1 11.0 10.9 11.8 11.1 11.5 12.3 11.5 12.8 13.5 12.5 12.5 12.5

TABLE E 36 -- CR DATA FOR GROUP 3 UNDER TREATMENT 3 - FEMALES





**B29861**